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Electricity is Cheap

THE first Weir Report, upon which the recent reorganisation of our system of electricity supply is based, had as its twin objective the reduction in price and the greatest availability of electrical energy to the consumer. We have always regarded the latter as likely to provide the more immediate fruits of the Central Electricity Board's operations, as we believe that some years must elapse before the results of co-ordinating generation can, in the generality of cases, benefit the smaller consumers.

That this should be so need not disturb us unduly. A widely spread availability of electricity is surely the more pressing need, since the cost of electricity is already low enough to the great majority of the population of Great Britain to justify a very much greater use of it than is now being made. Last year we published a table of undertakings charging one penny per kWh or less for domestic purposes. This list showed that most towns of any size and very many quite small ones are offering rates reasonable enough to encourage all uses of electricity, except for long-hour space heating and water heating; since then the numbers of undertakings coming within the scope of this table has considerably increased, while many of those previously included have made striking reductions.

Nevertheless, there is certainly an idea abroad that electricity is expensive. We have even read expressions of regret that this should be so by men of scientific eminence, which contain no qualifications as to relative unit prices of the competing methods, and no apparent recognition of the fact that these may be of any moment. This feeling that electricity must be expensive owes its origin, we think, far more to the belief that anything better must cost more—a common confusion between value and price—than to reported experiences with obsolete apparatus or to rash endeavours to use electricity extensively in areas where unreasonable rates are charged for domestic power and heating.

While Press propaganda may have helped to educate the public to anticipate great benefits from electricity, it has probably at the same time—by directing attention almost exclusively to cost and holding out roseate prospects of an electrical millennium when the prices comes down—caused many people to decide to wait "until the cost is low enough." It is the fallacy implied in this reservation that must be exposed. While we cannot expect to get much long-hour space-heating or water-heating load at rates in excess of a halfpenny per kWh, there are many directions in which electricity can be economically used at the higher rates in our table. As an illustration of this, we have noted the astonishment with which our own low figures of cost for electric cooking have been received, though it is accepted, as a matter of course, that the results are better than could be obtained by any other method.

It has been said, rightly, that low prices are no substitute for salesmanship, and emphasis should be laid on making the supply available, in which expression we include the provision of apparatus on easy terms and a ready 24-hour service. If that be done everywhere, the

question as to whether electricity costs a little more or less for the heavier domestic uses than its alternatives will come to be regarded much as we now regard the relative costs of electricity and gas for lighting—a matter of very little importance.

A Flourishing Company

IN times of stress, financial preparedness and skilled leadership are valuable assets, as those who have lacked them have fully realised during the past year or two. To these two attributes the success of such concerns as "Henley's" is mainly due. Sir George Sutton's speech at last week's meeting of the company indicated that Henley's are weathering the storm as few other industrial concerns are doing these days. It also showed that the reproach often hurled at British manufacturers that they hesitate to abandon old machinery and methods for something more up-to-date and more efficient cannot apply to this company. Having developed a new lead press, which is claimed to be far in advance of any machine of its kind yet made, the company is determined to substitute it for all its old machines. And that is where financial preparedness comes in; the cost of the new machines is provided for by reserves against obsolescence. Moreover, the cost of the experiments and tests involved is written off from resources and nothing is debited in the capital account for the valuable patents. The unprecedented fall in the prices of materials has also been counteracted by the application of appropriate reserves, and provision is being made against losses on the Australian exchange. To do all this and still be able to maintain the dividend at its existing satisfactory level is a feat for which Sir George and his colleagues are deserving of the greatest credit.

Entertain the Consumer

To interest consumers and potential consumers, that is, the whole population of an area served by an undertaking, in electricity supply generally is of fundamental importance, and one of the best ways of doing this is to organise visits to the generating station, sub-stations, and other works which make an impression on the public mind. During the visit of the North Midland Area Committee of the Electrical Development Association recently to the Ferrybridge power station of the Yorkshire Electric Power Co., Mr. H. Hobbs, resident engineer, mentioned that since the station was put into operation four and a half years ago about 6,000 actual and potential consumers had been entertained in the works. Other undertakings, including the Shropshire, Worcestershire and Staffordshire Electric Power Co., are doing similar work on which all are to be congratulated, but there is much room generally for increased activity in this connection. That to get a prospective consumer electrically interested in a general way is more than half the battle cannot be overstressed.

Electricity in Agriculture

THE agricultural research conducted at the Rothamsted experimental station is too well known to need any introduction. There are now one thousand plots under observation at Harpenden, Herts., and the experiments attract visitors from all over the world. The past year has been one of considerable development, and it is a source of satisfaction to learn that the numerous possible applications of electricity to farming operations are not to be excluded therefrom any longer. Investigations into this subject are to be divided into three groups: first, appliances known to be useful, but not yet as widely used as they might be, are to be demonstrated; secondly, devices not in common use so far, but which are expected to have a future, will be examined critically; and, thirdly, possible applications of electricity which are not themselves economical at present are to be investigated. It is to be hoped that the requisite supply of power and the necessary equipment will be made available promptly, since this new work which Sir John E. Russell, the director, has set himself will be looked forward to with keen interest by all who appreciate its importance. One of the best hopes of the farmer would seem to be in the production of high-quality produce for which there is a demand, rather than low-quality produce of which there is a super-abundant supply. The problem of low price levels is beyond the scope of these investigations, but it is the duty of all concerned to attack it from the other aspect of attempting, with the aid of machinery, which is best driven electrically, to lower the overall cost of production.

An American Reminder

A COMMUNICATION which has reached us from the United States proves that British electrical manufacturers are not the only people who are watching with interest the progress of the recommendations made by the Weir Committee on Main-line Railway Electrification. The Copper and Brass Research Association, of New York, has made a careful study of the figures given in the report and estimates that the complete scheme would require no less than 1,000 million lb. (about 447,000 tons) of copper. The Weir report mentioned that 330,000 tons of copper would be required for the overhead lines alone, but at the same time suggested that steel-cored aluminium cable might be a practical alternative for a considerable portion of the catenary if the price proved more favourable. If the price of copper remains anywhere near the low level to which it has fallen, until the time comes for the proposals to be translated into action (as we hope they will), then its use will have to be seriously considered. We would not suggest that the anxiety of American copper producers to see the scheme carried out is a reason for its execution, but it is as well to be reminded of the benefits which main-line electrification possesses for the electrical and allied industries.

Avoiding the Groove

LONG experience with one plant may be expected to give a superintending engineer a sound knowledge of practical detail and thus ensure reliable operation. This advantage may, however, be purchased in some cases by a narrowness of view-point that would tend to depreciate his ability when new circumstances, such as plant extensions, may call for an enlarged outlook. In a recent publication by the Association of Supervising Electrical Engineers, attention is drawn to this aspect of plant supervision, and it is submitted that membership of that body provides a suitable corrective through the educational effect of bringing men of the same calling into closer technical and social touch. That is our own belief also.

Rural Propaganda

IT is clear from the examples which we have reported recently that electrical equipment is now becoming a regular feature of agricultural shows. The seal appears to have been set upon the practice by the award of a medal to the General Electric Co., Ltd., at last week's Royal Show, Warwick, for its "Drumotor" equipment. There is obviously a tendency for the two parties concerned in this matter to meet each other half way. The farmer realises the need for the most up-to-date and efficient equipment that he can obtain, while the supply authority is endeavouring to build up a rural load. By far the best way to present the claims of electricity to the farmer's consideration is at the agricultural show where the whole rural community meets. Telling exhibits of agricultural, dairy, and domestic equipment stimulate interest, and are a valuable means of educating country people to the idea of electrical service. We wish more power to the elbows of those enterprising manufacturers and supply authorities who have taken up this effective propaganda work, and congratulate E.D.A. upon the practical assistance which it is providing.

Changing Switchgear. By G. H. Swingler, M.I.E.E.

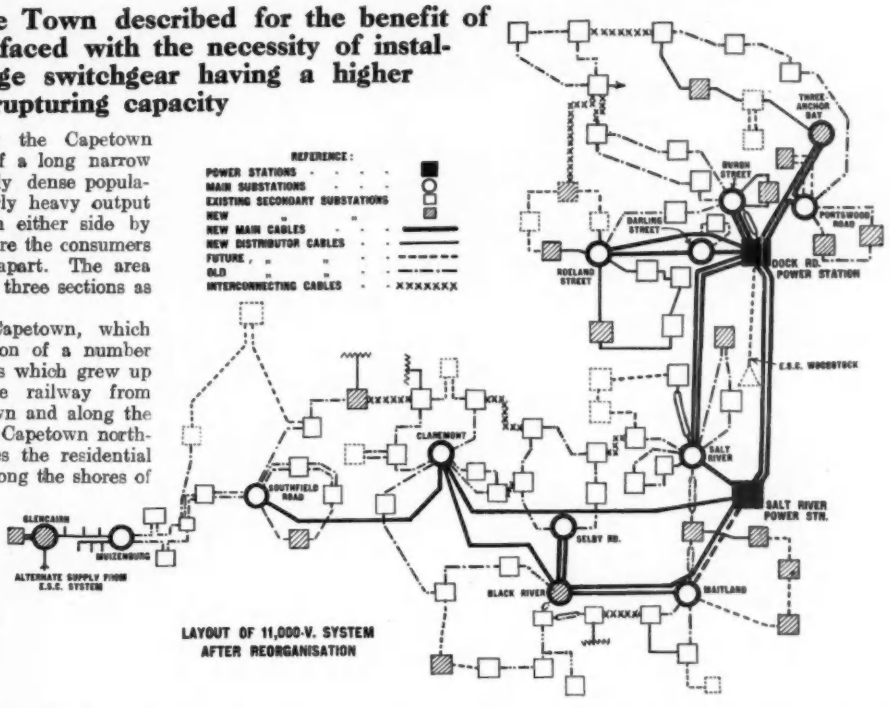
Experiences at Cape Town described for the benefit of supply engineers faced with the necessity of installing high-voltage switchgear having a higher rupturing capacity

THE area supplied by the Capetown undertaking consists of a long narrow district, having a fairly dense population and consequently a fairly heavy output per square mile, bounded on either side by a sparsely populated area where the consumers are a considerable distance apart. The area supplied may be divided into three sections as follows:—

(*a*) The City of Greater Capetown, which represents the unification of a number of smaller municipalities which grew up on either side of the railway from Capetown to Simonstown and along the main railway line from Capetown northwards. It also includes the residential suburbs of Table Bay.

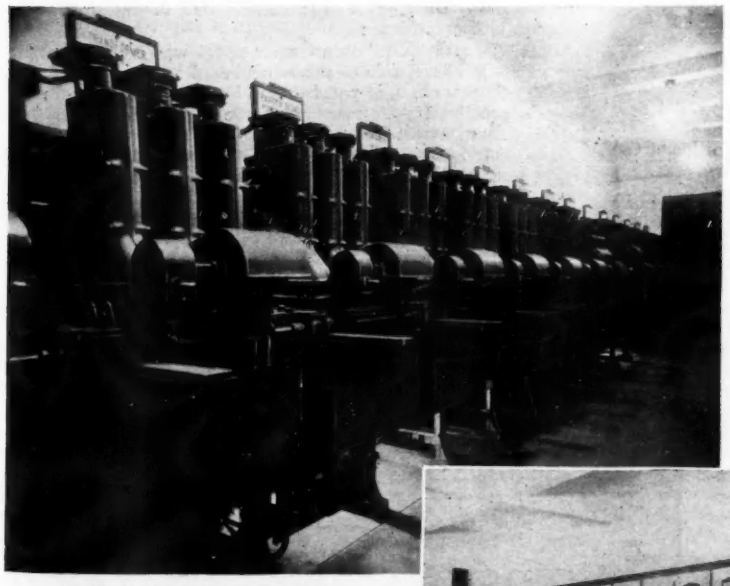
(*b*) A strip of low lying country known as the "Cape Flats" and forming an isthmus connecting the Cape Peninsula with the mainland and bounded by Table Bay on the north and by False Bay on the south.

(*c*) The mountainous district forming the Cape Peninsula.



LAYOUT OF 11,000-V. SYSTEM AFTER REORGANISATION

From the date (1913) of the unification of the various municipalities into the City of Greater Capetown until about 1920 the distribution system consisted of a chain of sub-stations following the Capetown-Simonstown railway. At that time power was transmitted from the Dock Road power station as far as the Claremont sub-station at 11,000 V and from Claremont to Muizenberg at 3,300 V, the old generating station at Muizenberg acting as a standby for the 3,300-V system. From 1920 onwards the system developed rapidly necessitating the provision of two other lines of sub-stations, each roughly parallel to the original one, and the extension of the 11,000-V system to Muizenberg.



11,000-V Metal-clad Switchboard

In 1922 the Government of the Union passed the Electricity Supply Act which provided for the setting up of the Electricity Supply Commission whose duties were, *inter alia*, to stimulate the provision of a "cheap and abundant" supply of electricity within the Union. Shortly afterwards it was decided to electrify the suburban railway between Capetown and Simonstown. Primarily to supply energy for the electrified railway system and also to fulfil the Act, the Commission proceeded with the construction of the Salt River station and entered into an agreement with the Corporation as to the parallel running of the two power stations by means of two 0.2 sq. in., 3-core, 11,000-V cables; three cables of this cross section were also run to important sub-stations on the Corporation system. The Merz-Price balanced-voltage system of protection was adopted, necessitating the laying of pilot cables at the same time. Current-limiting reactors (Metro.-Vick.) were installed at the three sub-stations to which the new main feeders from the Salt River generating station were run, as the increased possible short-circuit kVA made the existing Reyrolle Type "C" gear (which has a rated rupturing capacity of 75,000 kVA) unsafe under fault conditions.

The prospect of building up a very extensive cooking and heating load was good, but the first essential was to ensure that the transmission system was sufficiently strengthened to carry the anticipated increase in load and to make the best possible provision for continuity of supply, and it was decided to rearrange the entire system. Up to that time the general practice had been to run the 11,000-V system as dead-end feeders, each supplying a number of sub-stations so arranged that each sub-station could be supplied from more than one source; protection against cable faults was provided at the generating station only, the feeder switches in the sub-station being of the non-automatic type. The new cables were arranged as ring mains, provided with Merz-Price protection, through the principal sub-stations, the

Control Panels in Salt River Sub-station

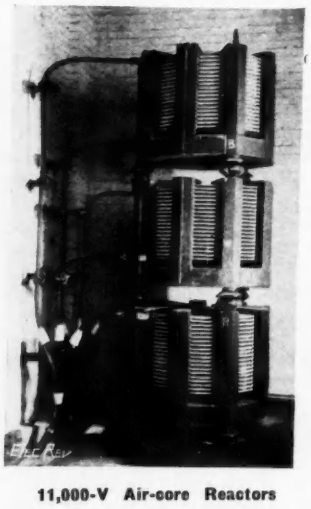
existing cables being utilised as distributors, arranged, wherever possible, as a ring on the more important sub-stations. With this arrangement the switchgear in the larger sub-stations would be called upon to deal with fault currents of considerable magnitude.

In view of the large amount of additional copper in the new 11,000-V system, there were two alternative methods of dealing with the greatly increased fault kVA at certain sub-stations situated close to the generating stations :—

(*a*) The installation of current limiting reactors between the incoming feeders and the existing switchgear.

(*b*) The replacement of the existing switchgear.

In considering which of these alternatives should be adopted it was borne in mind that the switchgear in question could, if required, be economically used in the new sub-stations to be provided at points on the system situated at greater distances from the generating stations. Owing to the inherent disadvantage of reactors, it was decided to take the longer view and carry out the more difficult work of replacing the switchgear involved by heavier-duty switchgear also of the fully armour-clad type. Tenders were called for and Reyrolle and Co. were awarded the contract to supply the whole of the new gear.



11,000-V Air-core Reactors

In considering the replacement of existing 11,000-V switchgear the chief points requiring attention were :

(*a*) Necessity for carrying out the work without interruption of supply.

(*b*) Safety of erection staff.

In nearly all cases the existing sub-station sites allowed room for extensions to the buildings, as the policy followed had been to obtain sub-station sites of not less than 50 ft. by 50 ft.; although in many cases this area exceeded the actual requirements at the time of purchase the policy has been justified.

The sub-stations where alterations were required fell naturally under two headings :—

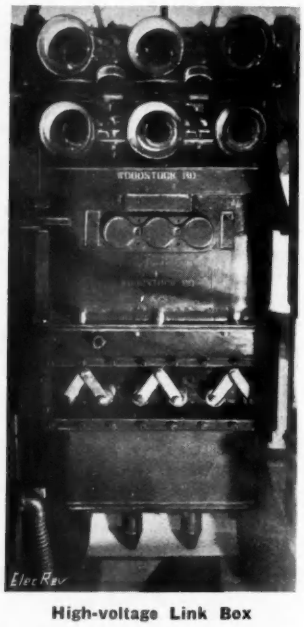
(1) Those which were sufficiently large to allow the new switchgear to be erected without disturbing the existing switchgear, or which permitted the addition of the necessary accommodation to house the new gear.

(2) Sub-stations from which existing switchboards had to be partly removed to enable a portion of the new switchgear to be erected in the space thus released.

In sub-stations coming under heading (1) the change-over from the old to the new switchboard was a comparatively easy matter. As an example, the method of dealing with Salt River sub-station will be described. Here the existing 11,000-V switchgear had to be replaced by switchgear having a rupturing capacity of 350,000 kVA, and, as there was insufficient room in the building for adequately housing the new gear, it was decided to build a switch-room annexe and to provide for the remote mechanical operation of the new gear through one of the walls of the old building. This enabled the new gear to be completely erected and tested before the transference of the feeders from the old board.

At this time Salt River sub-station was fed by two feeders direct from Dock Road and by a third from the Salt River station, a bank of reactors being placed between the latter and the sub-station switchgear as mentioned earlier. At times of light load this feeder was disconnected from the reactor bank and connected direct to the panel provided for it on the new board. The old and new boards were then coupled together through the reactor bank, and the process of transferring the outgoing feeders from the one board to the other was carried out at such times as alternative supplies could be arranged from other sub-stations. In sub-stations coming under heading (2), *i.e.*, where the available space did not allow of the new switchgear being erected without disturbing the existing gear, the change-over required more consideration. In certain cases where transformers were installed indoors and adjacent to the switchgear to be replaced, it was possible to substitute outdoor-type transformers and in this way to obtain sufficient space to erect a portion of the heavier switchgear.

From time to time alterations have had to be made necessitating either the addition or removal of panels from switchboards without interrupting supply from the sub-station concerned. The contractors made up a set of 11,000-V jumper connections, complete with contacts, to enable any two panels to be erected together on the "cable" side, *i.e.*, to cut out the switch and busbar from the panels concerned. It is, of course, necessary for the cables to the panels to be connected by the jumpers to be made "dead" for sufficient time to allow of the latter being installed. These "jumpers" now proved invaluable, and, as an example of their use, the procedure followed in replacing certain switchgear at St. John's Street sub-station is briefly described.



High-voltage Link Box

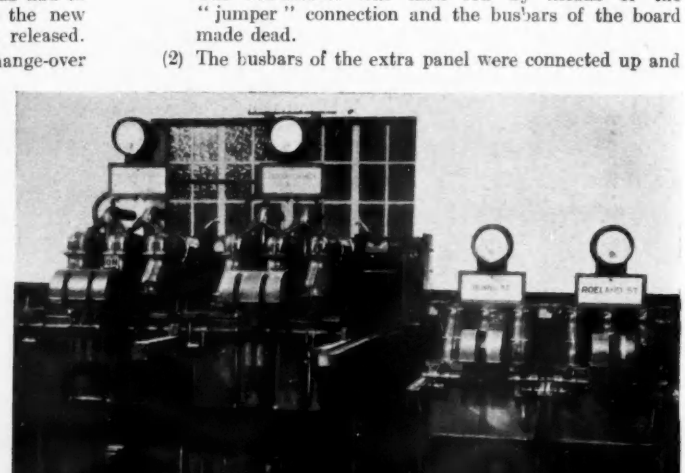
At this sub-station the switchgear consisted of four "C1" panels, two being non-automatic feeder panels, controlling feeders from Burg Street sub-station and Roeland Street sub-station, and two transformer panels with overload protective gear controlling the 11,000-V side of the sub-station transformers. It was necessary to replace the transformer panels by heavier type gear, but it was decided to retain the non-automatic panels. As laid out the transformer panels were erected on the left-hand side of the board, and there was insufficient room on the right-hand side for the heavier panels. There was space for the latter panels on the left-hand side of the non-automatic panels, however, provided the existing transformer panels were removed first. This work was carried out in the following sequence of operations :

(1) A spare "C1" transformer panel was erected on the right-hand side of the switchboard and to connect the busbars of this panel to the busbars of the board one of the transformer panels was "jumpered" to the Burg Street feeder panel, the second transformer supplying the sub-station load by means of the Roeland Street feeder during the insertion of the "jumpers." The sub-station was then fed by means of the "jumper" connection and the busbars of the board made dead.

(2) The busbars of the extra panel were connected up and the transformer not in commission was connected to this panel.

(3) The sub-station load was carried by "jumpering" one of the feeder panels to the extra transformer panel, and the busbars were made dead once again.

(4) The two "C1" transformer panels were removed, the



Switchboard at St. John Street Sub-station

new panels erected in their place being connected to the small non-automatic panels by a special busbar coupling trunk.

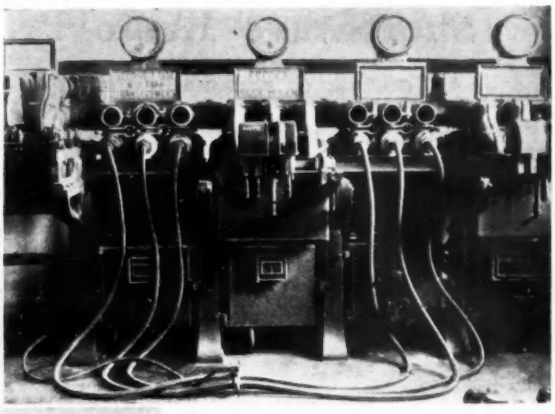
(5) The transformer not in commission was jointed up to one of the new panels.

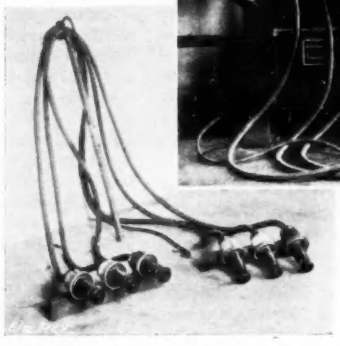
(6) The extra "C1" panel was disconnected and the "jumpers" removed, the transformer connected to the former then being connected to the second new panel.

In one instance, where the first portion only of a new board could be erected initially, copper "jumper" connections were made up departmentally to enable the additional panels to be erected after the first portion of the board had been put into commission.

At Woodstock sub-station, where an old cubicle-type board had to be replaced by a metal-clad board, the whole of the former had first to be removed and the foundations for the new gear constructed in the space vacated. Continuity of supply from the sub-station was maintained by jointing the incoming feeder cables from Salt River "hard on" to the transformers, the latter being controlled on the e.h.p. side from Salt River sub-station until such time as the new switchboard was commissioned.

In rearranging the existing cables and the formation of the ring mains with Merz-Price protection it was found to be desirable in several instances to combine two cables of small cross section, where these followed the same route, to form a single composite feeder; two feeder switches were thus saved in each case. Should a fault occur on one of the "legs" of this composite feeder, however, it would be necessary to gain access to the ends of the two cables quickly for the purpose of testing and isolating the faulty "leg" without melting the compound in the cable dividing box. To meet these requirements a special type of oil-filled link box was fitted to certain feeder panels, which provided a simple means of disconnecting the cables for the purpose mentioned above.





High-voltage Jumper Connections

Electrical Quotations: A Reply

The Point of View of the Preparer

AFTER reading the article upon "Electrical Quotations" in the ELECTRICAL REVIEW of July 3rd, one would correctly assume your contributor to be connected with the firm inquiring for motors, in which case one can duly sympathise with his point of view. As one "on the other side of the fence" I would like to deal with some of the points raised.

Insufficient Supervision

Your correspondent's strictures regarding the lack of proper supervision in the preparation of tenders are fully justified. It must be explained, however, that many manufacturing firms to-day, possibly due to the state of trade, depend on junior employés to a great extent. These cannot, and should not, be expected to show the same amount of interest or regard as a senior who, apart from being an experienced estimator is very often a technical man, knowing his job and, by reason of this, able to impart the knowledge of what he wants (and expects) from the typist setting out the tender.

How Tenders Might be Improved

Many suggestions could be put forward for the improvement of tenders, but after many years' erperience in the electrical engineering industry, I cannot understand why manufacturers are content to employ shorthand-typists (very often juniors) who set out tenders in the way complained of in the above-mentioned article. A shorthand-typist who takes sufficient interest in his or her work should be able to set out correspondence in a concise, clear and grammatical form, once he or she is used to the work in question. Any quotation can very often be made "attractive" in so far as the setting-out is concerned with an expert shorthand-typist conversant with such work.

For a number of years now I have been able to take estimates from an estimator covering standard equipment (including a.c. and d.c. motors, hand- and automatically-operated control gear, also switchboards) without any of the main details being dictated, merely making notes of any special points which require explaining to the client. This, however, cannot be done without several years' experience in such work, but I am quite sure that it can be accomplished if one is sufficiently interested in the work. Any of the complaints regarding the incomplete or careless nature of the replies could have been watched by an expert shorthand-typist, provided that the original inquiry from the client had been handed over for guidance.

The Elimination of "Padding"

The author of the article objected to "padding" in tenders, but I would take the liberty of accusing him of a little unnecessary "padding" in his own illustration, apart from which information regarding the type of bearings and terminal arrangements (details which are very often needed by the inquiring firm) is omitted.

Taking the illustration already cited (with the addition of hypothetical details relating to speed, pulley sizes, technical data and price) I would suggest that the following is even more concise and clear than that given:—

SUPPLY: 3-phase, 50 cycles, 400 volts a.c.

Standard squirrel cage induction motors each fitted with two end shields . . . . . bearings, terminal box screwed for conduit, standard pulley and slide rails. Temperature rise would not exceed . . . . . after continuous full load run. The prices quoted include:—

Starting gear of the star-delta or compensator type as specified, of the oil-immersed pattern, complete with oil and the specified trips.

B.H.P.	Motor.	Type of Starting gear.	Pulley size. Inches.	Full load Speed. R.P.M.	Full load Eff'y. %	Full load Power factor.	Price each complete.
7½	Prot.	Star-delta	7×5	720	87	.81	£9 10 6
15	E.V.	Compensator	9×6	710	88	.83	£15 9 3
20	E.V.	Compensator	10×6	720	86	.79	£19 5 0*

* Reduction if pulley and slide rails are not required: £1 10s.

The supply details are always more distinct if placed immediately above the quotation itself, as in the manner shown, and when setting out schedules the heading of any table looks far neater between two horizontal lines (not above one line as many typists think) and the table should be completed by a horizontal line extending right across the details given; one can then see immediately that the table is completed.

It should be borne in mind that technical estimating undoubtedly requires expert attention both from the point of view of estimating and typing; also, it is far better to employ one employé who knows his job well than to employ two to do the same work, who show no thorough understanding or interest in what they are doing. Against this, however, one cannot get away from the fact that many manufacturers to-day are not willing to pay the salary which an expert estimator or shorthand-typist used to such work would expect, overlooking the fact that such an employè would be a valuable addition to their staff.—SHORTHAND-TYPIST.

Point-working Machine for Railways

At Skillington Road Junction, on the Highdyke-Stainby ironstone branch line, the L.N.E. Railway Company has installed an electro-gravity point machine, supplied by the British Power Railway Signal Company. The equipment comprises a short-rail treadle and a machine for converting the treadle impulses into rotational action. The treadle is depressed by each wheel of the vehicles passing over it. The advantages claimed for the apparatus are rapidity of operation and negligible expenditure of consumable material (batteries).

Short-wave Radio Propagation. By N. Wells, B.Sc.

An outline of the major principles underlying the selection of wave-lengths

OF all radio receivers, the first is undoubtedly the most interesting, for the human eye is sensitive and selective to a degree that exceeds by far any invention of man: in fact, there are occasions when, by the exercise of will power, human sight can tune out and be effectively blind to the most stubborn of incident phenomena. The eye is, of course, sensitive to light and, as there is a strong similarity between the properties of light and those of the radio disturbances employed for wireless communication, one may imagine an eye tuned to the frequencies commonly associated with short-wave wireless and treat the subject of propagation partly, if literally, from such a point of view.

Properties of Short Waves

Considering the properties of "short" waves, that is to say, of waves roughy 10 to 100 metres long, one can imagine a plain vertical transmitting aerial radiating a visible glow into the surrounding medium. The energy streaming along the ground tends to diminish and finally disappear for all practical purposes at a few hundred miles, while the energy radiating at an inclination to the earth's surface spreads itself intc the proper medium, makes a gracefully prolonged curve, and finally comes back to the earth, say, some four thousand miles from the source of supply. The most effective "rays" leave the aerial at an angle inclined approximately 12 degrees to the earth's surface; this point has an important bearing on aerial design, for, provided an aerial is equipped with phasing coils at suitable intervals and of suitable form, or other means are adopted for suppressing alternate half waves, then the higher the aerial the lower is the angle of main propagation.

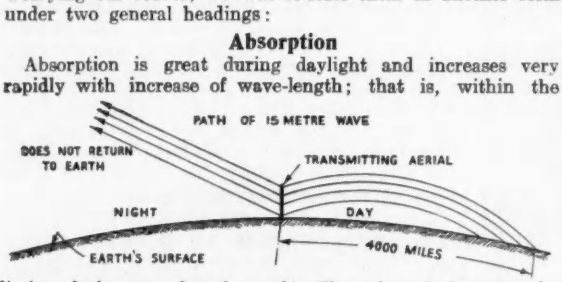
But there are other properties of short waves that merit attention, for if we varied the frequency, or wave-length, of the radiations we should be struck with two facts: first, that as the frequency was increased, or wave-length shortened, the energy streaming upwards would bend less and less and, ultimately, it would stream up and never return; *also we would find that there was considerably less bending during the night than during the day.* Moreover, in addition to bending and spreading, the energy would suffer definite loss, or absorption, in the surrounding medium, which loss would be greater on the longer waves. We are now in possession of useful information which may be summarised into four points, as follows:—

1. Short waves are effective at a great distance because they travel upwards, are refracted into a long curve, and thus travel downwards and reach the earth's surface again.
2. The bending effect is less on the shorter than on the longer waves, and less again on all short waves during darkness.
3. Short waves are absorbed, as distinct from thinning out due to spreading, and such absorption is less marked on the shorter waves; again, it is less for all short waves during darkness.
4. The fourth point is a logical deduction from the above three, *viz.*, since bending and absorption vary with variation of wave-length and daylight, it follows that the distance from where the waves leave the aerial to where they arrive back on the earth's surface must vary also. Thus, for a given distance to be bridged by radio, there are certain definite wave-lengths that fulfil best the day and night conditions.

These are very important facts and so, at the risk of wearying our reader, we will re-state them in another form under two general headings:

Absorption

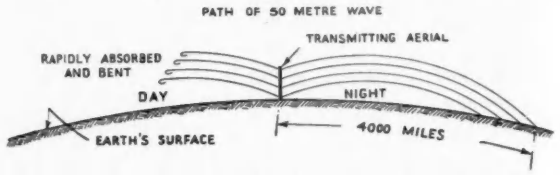
Absorption is great during daylight and increases very rapidly with increase of wave-length; that is, within the



limits of the wave-lengths under discussion, it increases in proportion to the square of the wave-length. This condition accounts for the fact that the shorter waves are employed for daylight services.

Bending

Bending depends on the sun's effect; more accurately, on the difference of this effect as between the upper and lower layers in the medium surrounding the earth. It is reasonable to expect, and has been ascertained as a fact, that bending is greater as wave-length is increased. During darkness the sun's effect evaporates, as it were, and becomes the minimum towards dawn. It follows that waves appropriate for a given distance during daylight no longer fulfil the requirements of curvature for that same distance during nightfall, so that waves whose path would have been too curved during



daylight, but whose diminished night curvature will be appropriate for the given distance, must be employed for the night service. This condition accounts for the longer waves employed during darkness.

In winter, as there is less daylight, the absorption and bending on all the short waves is less than in summer. Thus, for a given distance between any two communicating stations, both day and night waves should be longer during winter than during summer. It is also obvious that during winter the day wave will enjoy fewer hours of useful service, in consequence of which it is becoming customary during winter to employ an intermediate wave to bridge the period between sunset and complete darkness. As summer approaches, the intermediate wave often gradually slides into the summer night wave. For the dawn period, owing to the fact that the sunrise rays have a rapid action, it is seldom, if ever, necessary to employ an intermediate wave-length.

Wave Illustration.

At this stage it is convenient to divide our waves very roughly into three groups of "short," "intermediate," and "long" short waves; say, from 15 to 19, from 22 to 30, and from 40 metres upwards. The accompanying sketches will convey an impression of how the first and last groups are thought to behave. The lower figure illustrates the flight under daylight and night conditions of a short wave over a distance of some 4,000 miles; although lines are a very crude method of depicting a form of energy that is by no means concentrated into line-like paths, yet the figure serves to illustrate the effects. The above diagram is intended to illustrate the rapid absorption and bending of a 50-metre wave in daylight, and the same wave's flight under night conditions.

Lest the reader be beguiled with the simplicity of these explanations, it is well to repeat that, strictly, bending and absorption are neither matters of daylight nor darkness, but depend on the differential distribution of the sun's effect in the medium surrounding our earth. The difficulties of selecting wave-lengths for distances running through daylight, twilight, and darkness are very great and are complicated when the path of communication passes near the polar region where magnetic effects come into play, often with disastrous consequences. However, the broad fact emerges that the shorter waves are suitable for daylight and the longer waves are suitable for darkness.

These remarks have been written mainly from the point of view of the transmitting aerial, though the same laws govern reception, with one important difference; when the route lies east and west, or *vice versa*, it not infrequently happens that, due to what is known as the sunrise barrier, signals are detected at the westerly station some time before detection is possible at the easterly station, the time being the period of sunrise at the latter point. In other words, during sunrise the path of waves arriving from the west is through a higher and less propitious medium than is the case with the initial path followed by waves propagated from the east.

Phosphates and Boiler Feed

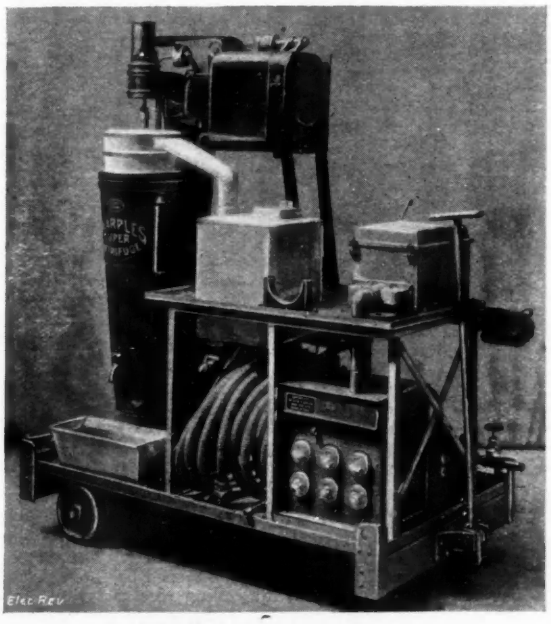
The treatment of boiler feed water with phosphates, while keeping the boiler surfaces free from scale, causes a soft scale in pipe lines and heaters. In a case described in *Power*, due to process uses of steam, 70 per cent. make-up, containing 12 to 14 gr. of total solids per gal. is required. The water capacity of the 450-lb. per sq. in. boilers represents only 35 minutes of full-load working. To eliminate the trouble 10 lb. of phosphate is fed to the pump suction for every 30,000 gal. of water for 20 seconds at intervals of 1½ hours.

Oil Purification Plant. By H. E. Hutter, A.Am.I.E.E.

The treatment, storage, and distribution of switch and transformer oil

IT has now been established that the dielectric strength of an insulating oil is governed both by the presence of fibrous matter and moisture; moisture alone has not the deleterious effect formerly attributed to it. Impurities in transformer oil consist of sludge formed by the oxidation of the oil at high temperature, fibrous matter from the insulation, and moisture resulting from condensation caused by "breathing" of the transformer. In switch oils sludge is not formed, but the operation of the switches under load forms colloidially dispersed carbon; moisture and fibrous matter may also be present.

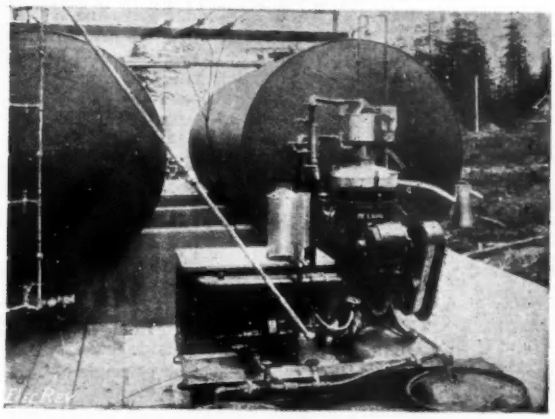
The routine drawing of samples of oil for inspection and testing from transformers and switches is most important if any risk of breakdown in service is to be avoided. The intervals permissible between these tests depend somewhat on the operating conditions. In the case of transformers intervals of three months are frequently met with, while for switches the state of the oil obviously depends to a great extent on the number of times they are opened under load. The dielectric test of the sample will indicate whether the oil requires purifying; if the test figure is below 17 kV for the B.E.S.A. test it should be at once cleaned, after which the minimum figure should be 30 kV. The principal methods for removing impurities are the centrifugal cleaner, the filter press, chemical methods, and decarbonising powders for removing the carbon with the aid of a centrifugal cleaner.



Portable Centrifugal Equipment

The centrifugal cleaner is the most popular type in use, due to the small amount of attention required and the shorter time to complete compared with the large amount of labour necessary in setting a filter press to work with its large number of papers to be placed in sections. The centrifuge will deal with moisture and foreign matter successfully, but is unable to remove the colloidial carbon from switch oil without aid; this will be dealt with later. The filter press is able to deal with only a limited amount of moisture, but will remove all foreign matter and the carbon, though a risk exists of fibrous matter passing into the oil from the filter papers. In the case of important installations it is usual to centrifuge the oil and then to pass it through a press using hard papers to remove the carbon. A special press which completes all operations is described later.

The centrifugal cleaner is constructed on the principle that centrifugal force generated by revolving the liquid in the bowl causes the heavier particles to travel in a direction at right angles to the axis of rotation. The separation of the matter in the oil is dependent on the specific gravity of the components, and under the action of the centrifugal force the heaviest particles of foreign matter move outwards. The water being of lower specific gravity than the solids, but heavier than the oil, will take up a position midway between them, special arrangements are made to keep the water and

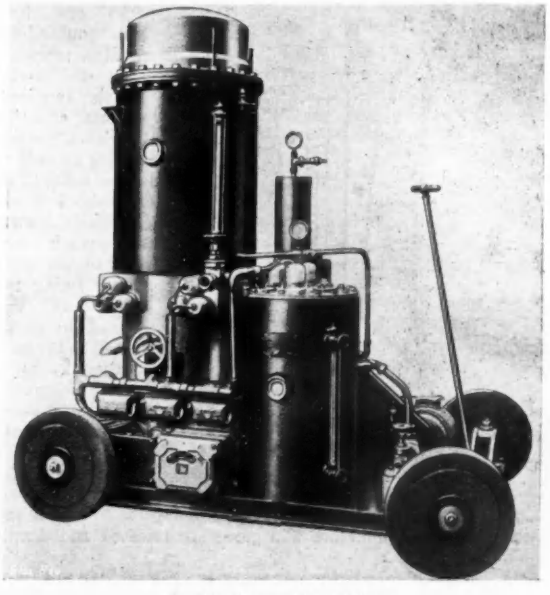


Conservator-type Centrifuge

oil streams separate, the solids being left in the bowl, spouts being provided for the clean oil and water. The first commercial centrifuge produced was the De Laval (1878). In this type the bowl consists of a number of cones which are rotated by a spindle at 10,000 r.p.m. in the small machines and 6,000 r.p.m. in the large machines. The mixture, consisting of water, oil, and fine solids, is fed in at the top, and as it passes down the centre of the bowl quickly acquires the same speed as the bowl. When it reaches the bottom liquid passes outwards and then rises between holes punched in the cones and separates into a number of very thin layers. It is between the cones that the actual separation takes place, the solids and water moving outwards, while the lighter oil moves inwards. When the heavier particles have moved 1/32 in. they strike the underside of one of the cones and are forced down; on reaching the edge they are thrown off into the sediment space. If the bowl is assembled with a water seal, the water separating from the mixture will displace some of the sealing water, which then flows out of the water spout. The oil being the lightest component of the mixture passes inwards flowing along the upper side of the conical disk. A section of the complete machine is shown overleaf.

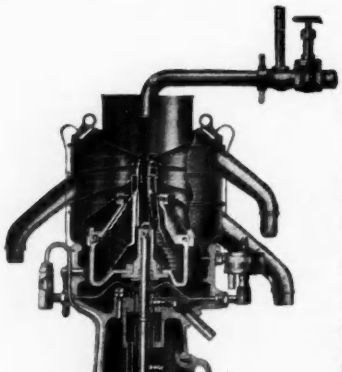
The oil for use in transformers of the conservator and "Inertaire" types should be dehydrated. Any danger of adding gas bubbles or dissolved gas to the oil can be overcome by discharging the oil from the separating cones into oil instead of leaving it open to the atmosphere. With the open type, due to the high speed of rotation, the oil is discharged in the form of a very fine film, and when it strikes the stationary bowl is atomised, the higher the speed the greater being the risk of atomisation.

In the "Laval" type of conservator centrifuge the design is



Mobile Stream-line Filter

such that the whole of the apparatus is filled with oil under pressure. The presence of water in the bowl enables these machines to be used to provide a water washing effect for the oil if required; fine fibres when saturated with water are much heavier than oil and thus separate out with greater ease. The bowl consists of a number of cones, but for cleaning the complete unit is revolved at high speed without any liquid; thus the dirt is flung off without dismantling any part, the dirt being easily removed from the stationary bowl.

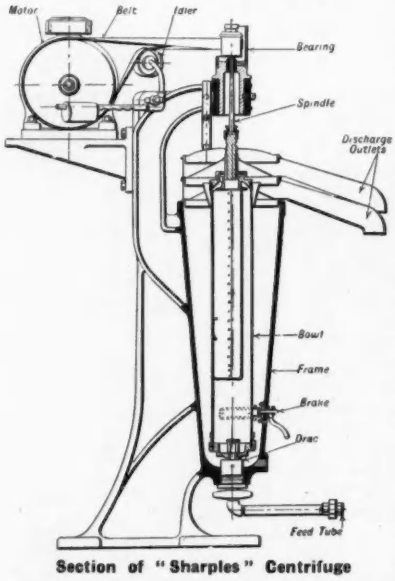


Section of "Laval" Centrifuge

The principle of operation of the Sharples centrifuge is the same except that the bowl consists of a cylinder 30 in. long by 4¼ in. in diameter, and the oil is maintained at the same speed of rotation by a one-piece three-piece wing. The dirty oil enters at the bottom, oil and water being passed out separately at the top. During operation the solids are thrown against the cylinder wall, the water being next with the oil innermost.

The portable machine has many advantages in power stations, &c., the entire apparatus being mounted on a steel trolley with a handle and wheels. A typical machine is illustrated on the previous page; the equipment comprises a centrifuge complete with strainers, suction and delivery pumps, an 18-kW heater arranged in six 3-kW stages, a thermometer, and two lengths of flexible hose. The filter press usually consists of several grids and chambers. A number of heated and dried sheets of filter paper are placed between each filter plate and grid, the whole being compressed tightly together; the sets of papers and plates are arranged so that any required number can be arranged in parallel according to the output required. The dirty oil is pumped through the papers into the clean oil tank, but the amount of moisture that can be removed is a very small percentage of the weight of the paper employed; the papers must be dried by heat for 24 hours before use.

The stream-line filter, also illustrated, operates on an entirely different principle to any other make, the oil passing between the papers instead of through them. The filter consists of a number of packs of filter paper mounted on spindles, springs being used to obtain the required pressure, and the number of packs varying according to the amount of oil to be treated. The oil is drawn through by vacuum, all solid matter being retained at the edge of the packs and removed occasionally by a reverse process with compressed air and then extracted through a sludge valve. The oil is heated and passed over trays to divide it into fine layers. Under the 27-in. vacuum all moisture and gases are released and drawn away by the pump.

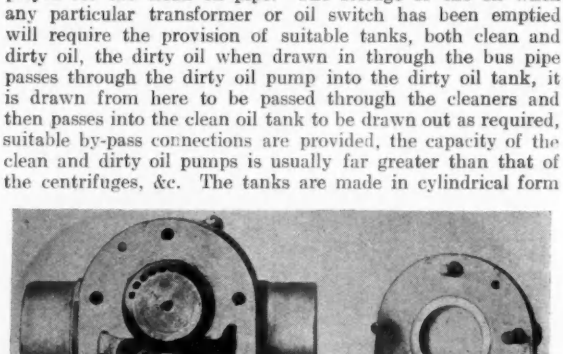


Section of "Sharples" Centrifuge

The use of chemicals for removing the carbon has not been generally successful, but a method different to any so far described is the "Laval" powder system; this system is used on the European Continent as well as in Great Britain.

The process consists of three stages: (1) dehydration of the oil, (2) addition and mixing of the inert decarbonising clay, (3) removal of the clay by sedimentation and centrifuging. A special tank is used which is first filled with dehydrated oil. Clay in the proportion of 1 lb. to 10 gal. of oil is then mixed in and the whole allowed to settle overnight and then passed again through the centrifuge. This method removes water, suspended matter, and all colloidially dispersed carbon, and also neutralises any acidity that may be present.

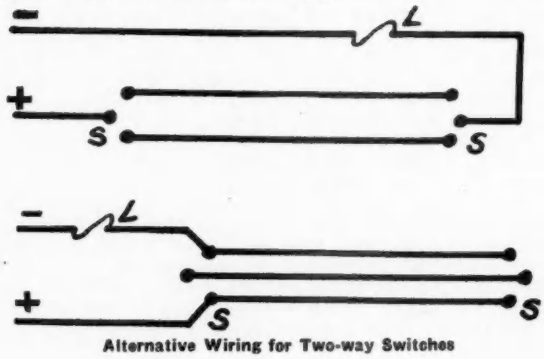
The most common oil pumps are those of the gear or cam types. The rotary pump of Allan, Sons & Co.'s make, an interior view of which is shown below, is a positive displacement pump with two cams inside the casing. These two cams rotate in opposite directions, and are maintained in fixed relation to each other by external gear wheels. The piping most commonly used is 2 in. outside diameter about ¼ in. thick, steel being usual, but sometimes copper is employed for the clean oil pipe. The storage of the oil when any particular transformer or oil switch has been emptied will require the provision of suitable tanks, both clean and dirty oil, the dirty oil when drawn in through the bus pipe passes through the dirty oil pump into the dirty oil tank, it is drawn from here to be passed through the cleaners and then passes into the clean oil tank to be drawn out as required, suitable by-pass connections are provided, the capacity of the clean and dirty oil pumps is usually far greater than that of the centrifuges, &c. The tanks are made in cylindrical form of welded steel, suitable inspection openings being provided; large size breathers are necessary to prevent the ingress of moisture, and some form of depth indicator may be fitted in the oil plant room.



A Positive-displacement Pump

Wiring for Two-way Switches

In all types of buildings the two-way system of controlling electric light is becoming increasingly popular. The method most widely known and most commonly used by the wireman is that whereby a wire from the ceiling rose is taken direct to the furthest or lowest switch. The nearest switch, that is the uppermost one in the case of stair-switching, is fed as usual by means of the positive loops. Two common wires between the switches then complete the circuit. This method, although excellent when the light is situated between the two switches, is often made the weakest point of the installation because the shoddy workman invariably wires the long switch-wire in two lengths and then makes a joint behind the switch-block nearest to the light. There is, however, an alternative method very little known which will enable any ordinary and existing switch-light to be converted into the two-way system without the necessity of a joint. This is done by employing one common wire between the two switches and then extending the switch-wire and positive feed from the first to the second switch. Although both methods are worked on the same principle, the second has two distinct advantages; first, it is decidedly quicker to instal and, secondly, when alterations or additions are necessary, the positive feed at both switches may prove useful.



Alternative Wiring for Two-way Switches

Electro-Farming in Germany. By R. Borlase Matthews, M.I.E.E.

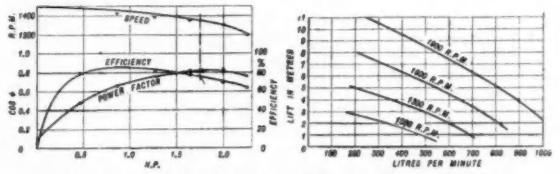
The large amount of new electrical apparatus exhibited at the German National Agricultural Show indicates a serious interest in the application of electricity to farm work

FOR many years agricultural societies and the like have had small generating stations and demonstration centres, and as the larger electric power supply undertakings developed the local bodies gave every support in the way of facilitating the erection of the distribution lines. There is now no longer the handicap of the limited capacity of a small station, as supplies are available everywhere from big generating plants. Moreover, great progress has been made in the technique of electro-farming, which has opened up great possibilities in the agricultural world for the big and the small farms alike, even in the outlying districts. At the same time, this impetus has raised the standard of living of the farmer and also the status of the industry. It is fully appreciated that electricity can be a much more powerful agent to the German farmer than it has ever been before because of the difficult period through which farming is now passing; the position is bad enough in England, but it seems worse in Germany. A farm is unlike a factory in that it cannot be shut down during a period of depression. While in England the line of least resistance is taken—that of laying arable land down to grass—the German farmer still maintains his ploughed land, but he is improving his methods, altering his rotations, and utilising more machinery.

The German National Agricultural Show, which was held in Hanover this year, offered an excellent and exceptional opportunity of ascertaining what are the latest improvements in electrical apparatus especially adapted to farming. The machinery manufacturers admitted that their prospects of sales in a time of depression like this were not very rosy. However, they showed their confidence in the future by exhibiting 5,500 pieces of machinery, out of which the very large number of 190 was entered for test as new. The latter figure compares very favourably with the bare dozen that are entered at the largest English show. In fact, machinery seems to be of more interest to the German farmer than livestock, for only about 1,300 head were on view. As the greater part of the machines shown in operation were electrically driven, a very neat overhead distribution system was provided throughout the showyard, and, although intended for use only during the week of the show, the wires were tightly strained as if for permanent use so that the great majority of visitors hardly realised that there was an overhead electrical distribution system in the showyard, as it blended with the general scheme of flying flags, decorations, and signs.

An Effective Demonstration

In one particular section, known as "the Elektro-Schau," every important electrical machine and piece of apparatus for use on the farm or in the homestead was demonstrated, and



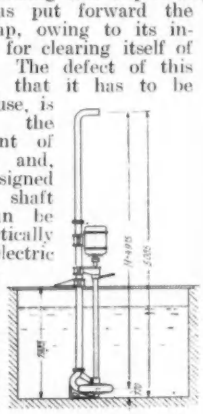
Typical Performance of a Liquid-manure Pump

an extensive area was set aside for advertising the part played by electricity in the dairy and on the poultry farm. This exhibit also had as its aim the showing of all possible attainments of and uses for electric power in rural industries, such as bakeries, butchers' establishments, wood and metal working shops, &c.

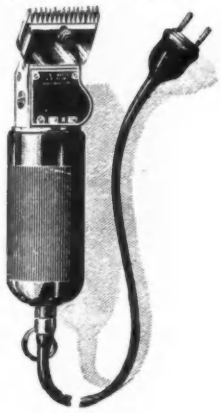
The general arrangement and management of this Central Electrical Exhibition was in the hands of the principal electricity supply undertaking of the Hanover district, the Prussian Electricity Supply Co., which deserves every credit for its very effective display that included, in the middle of the building, an exceedingly well equipped demonstration lorry, built on one of the largest chassis available and equipped with a 100-h.p. engine. It had neat permanent show-window panels on the sides in which apparatus was exhibited. In the interior a complete range of domestic apparatus in operation was on view, a central passage being provided for visitors, who entered at the rear and left at the front.

Liquid Manure Pumps

For a good many years on the Continent the importance of the application of liquid manure to the land has been fully appreciated, and many types of pump have been devised for conveniently handling this unpleasant fluid. The trend of development has put forward the centrifugal pump, owing to its inherent capacity for clearing itself of solid particles. The defect of this type of pump, that it has to be charged before use, is overcome by the simple expedient of submerging it, and, further, it is designed with a vertical shaft so that it can be driven by a vertically mounted electric motor supported well above and away from the liquid. At one time, two pumps were employed in liquid manure tanks, one for pumping and the other for agitating the fluids. Nowadays, however, one pump is employed, which is so arranged that by a turn of a hollow shaft, which is mounted around the main motor shaft, the delivery of the pump can be disconnected from the main delivery pipe and turned into the tank itself, hence the liquid can be thoroughly agitated before actual pumping is started. The electric motors generally employed for this purpose have two detachable feet and removable baseplates; angle plug receptacles are fitted to the motor carcase, so that no wiring is necessary after delivery. Tests are made by independent laboratories from time to time to establish their effectiveness and efficiency, which is quite good, as will be appreciated from an examination of the curves given herewith.



Arrangement of Liquid-manure Pump



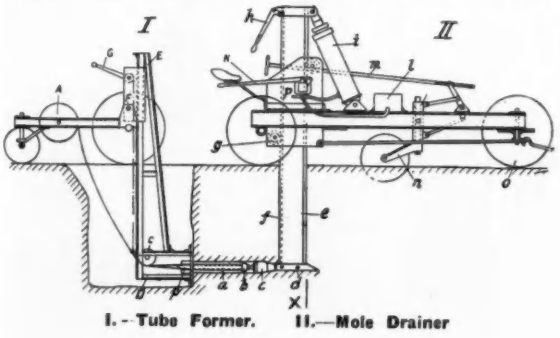
Self-contained Clipping Machine

Clipping and Shearing Machines

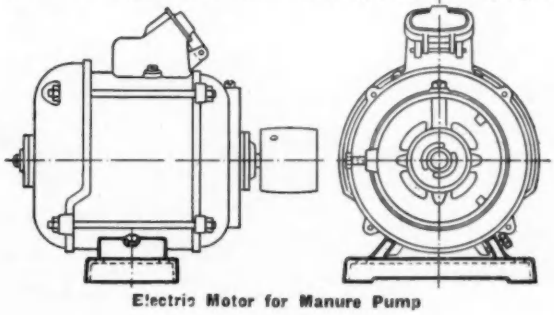
Machines for clipping and shearing have, by their very convenience and utility, long established themselves. Hitherto, though described as portable, the motor itself has proved rather heavy, and for that reason usually drives the clippers through a long flexible shaft—though flexible shafts at their best are not a very good thing to have on a farm. Hence, a new machine that was no view will be of special interest in that the electric motor is contained within the hand grip.

Mole-drain Cable Laying

Mole draining has long been the practice in ground that was sufficiently cohesive to prevent the walls falling in. Now, by a new development brought out by the Rud Sack Company, the advantages of this system of draining can also be utilised in much softer ground by placing a special tube-forming machine at the entry of the mole drain, which, as the mole advances, forms a strip of sheet steel into a tube which is drawn along by the mole. The strip of sheet steel (which may be either galvanised or painted) is provided in 700 to 800 yard lengths, though in practice the usual length of drain does not generally exceed 150 yards. The width of this strip is usually 6¼ inches, which forms a 2-inch diameter tube. As it affords a very smooth interior without joints, for the purpose



I.—Tube Former. II.—Mole Drainer

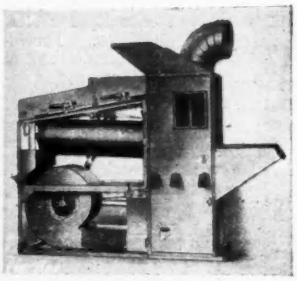


Electric Motor for Manure Pump

of a drain it is as effective as the ordinary mole drain 25 per cent larger.

A further development is to employ this machine for laying cables, the sheet-steel tube being formed around the cable and both being drawn together into the ground. Though actually the tube is of a bigger diameter than that of the cable, it has been found more practicable to lay the tube and the cable together, rather than to attempt to draw the cable into the tube subsequently. This is certainly a very neat and economical way of laying a cable in soft ground, especially as it causes no disturbance to the surface, since the only mark made is that of the mole carrier, which only produces a slit of about 1 inch in width, which soon closes up. The makers are anticipating considerable sales of their cable laying machines to War Office Departments, as they will greatly facilitate the laying of telephone and other cables underground and thus prevent their being destroyed by aeroplanes or shrapnel. In the diagrammatic illustration of the machine, the right-hand portion marked II is the mole drain proper, the mole itself being shown at the bottom at *c d*. The grip for the tube is shown at *b* and *a* is the tube itself. The supply of strip sheet steel is held at the drum at A, and this passes over the forming roller C and is finally shaped into the complete tubing at the point *p*. This portion of the apparatus I in the diagram remains stationary while the portion marked II is drawn forwards. A cable drum is not shown in this illustration; when used, it is placed immediately behind A and allowed to pass through a guide and then under the forming roller at C. The photograph shows a cable being laid in this manner. The strip sheet steel can be seen on the reel immediately above, where it looks very much like a belt. The forming roller at C can be just seen within the framework.

Mole-draining Cable-laying Machine



Corn-cleaning, Sorting, and Transporting Machine

Grain Handling

A neat and compact pneumatic grain delivery and sorting machine of a new type was exhibited. The 5-h.p. motor is built-in as a part of the machine, which is of all-metal construction. This is certainly a most convenient machine for use in conjunction with thrashing machines, so that the grain can be conveyed directly from them through tubes to the granary and thus save intermediate handling. In the illustration the motor cannot be seen as it is covered by the casing in the centre at the bottom, though the belt drive to the fan is visible. Several new forms of sack hoists were on view, including the "Demag," which was shown last year also. Though the newer machines were slightly cheaper, they were certainly nothing like as compact and convenient, but any of them would be of great convenience on a farm.

Pumps and Dairy Apparatus

As in France, the high-pressure automatic pump is very popular and deservedly so, for after all why should not the farm labourer fill his bucket with water from a tap as quickly as a townsman? This type of pump is not used to any extent in England as it ought to be. Its cost is comparatively low, as the capacity of the motor does not exceed ¼ h.p.

A large number of milk coolers with refrigerated brine passed through the lower portion were on view; they are very popular among farmers. There is a number of appliances of this type on the English market, and it is interesting to note that the German makers are as much at fault as the British makers in that they do not seem to realise that the parts which come in contact with the milk should be taken off daily for sterilisation. To facilitate this, the four pipe connections should be arranged for easy disconnection without its being necessary to use any tools.

It is now common practice to drive cream separators electrically; usually a belt is used, but in at least two new machines the electric motors were built as a portion of the machine itself, being direct connected to the bowl by a spiral drive, thus cutting out several of the gears employed on the ordinary type.

Generally speaking, electric drives were so common as not to call for specific attention; the belt drive is still in the ascendancy over self-contained machines, though obviously the latter are preferable on all scores.

The Suspension of Electric Cables

Applications of the "Talon" Self-locking Hook

A PROBLEM which arises in almost every branch of the electrical industry is that of supporting cables from sections of steelwork. In coal mines cables have to be suspended from H-section steel arches; in subways they have often to be carried from the girders supporting the roofs; whilst in structural steel buildings the necessity for supporting the temporary cables which are used during construction, in addition to those which are permanently fixed to supply the building, is only too obvious. In coal mines the cables have usually been held up by galvanised wire or tarred string, so that in the event of a fall of roof the supports would give way without damaging the cable, but the usual practice in most other industries has been to make iron clamps of the angle or double-jaw type which would fit the joists, bolt the sections together, and suspend from them galvanised S hooks which were inserted into the fabric slings which carried the cable. These clamps were expensive to make and awkward to fit, and usually resulted in a good deal of lost head room.

A fitting which has effectively solved this problem of cable suspension is the "Talon" self-locking suspension hook, thousands of which are already in use underground. "Talon" galvanised-steel hooks are made in two forms, known as the top and bottom types, respectively. The top type is made for fitting on the tops of steel joists, and it can easily be fitted or removed with one hand without the use of any tools at all. This type of hook makes the maximum use of the available head room, as the cables can be made to sit close to the undersides of the joists from which they are hung. The bottom type can be slipped over the bottom or open flanges of the joists with the same facility as the top type. It will support cables from beams fixed at any angle, and will even lock itself in position on a vertical flange, additional weight only serving to tighten the grip.

These inexpensive fittings, which can be made for any section of joist, and which can be used, of course, for supporting many things other than cables, are being marketed by A. B. Steele, Reculver Road, Beltinge, Herne Bay.—A.R.C.

Slipping on Top and Bottom "Talons" Applications of both Types of Hook

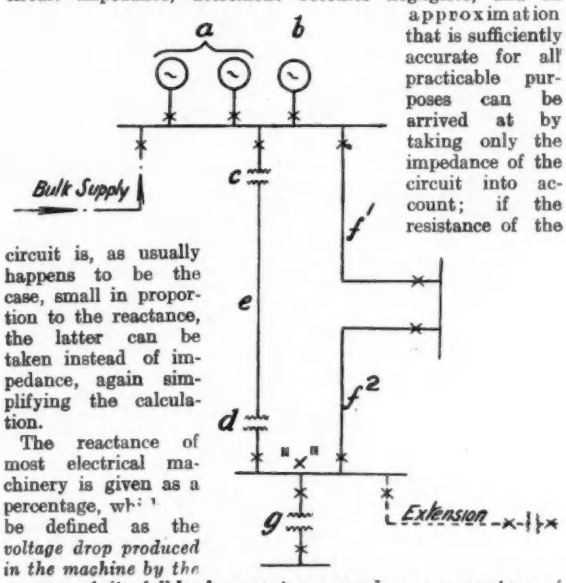
Short-circuit kVA. By V. Clements, Grad.I.E.E.

A quick and simple method of computation

WITH the continuous expansion of transmission and distribution systems, and more especially with the increase of plant capacity feeding into systems connected with the Grid, the question of the ability of switchgear to clear successfully any short circuits with which it may be called upon to deal is becoming more than ever pressing. Switchgear manufacturers usually give empirical figures of the maximum short circuits that their various types of gear should deal with, and the problem that confronts many engineers is how to compute simply and quickly whether their existing switchgear is, on the manufacturers' rating, large enough for the duty which it may have to perform, or what switchgear must be installed on extensions.

Alternative Methods of Calculation

As is well known the short circuit on a system is an inverse function of the impedance between the source of supply and the fault and depends also to a certain extent on the power factor of the circuit and the decrement* factor of the generating plant, and to obtain a true figure is a highly complicated matter. Unless generator reactance is a large part of the total circuit impedance, decrement becomes negligible, and an approximation that is sufficiently accurate for all practicable purposes can be arrived at by taking only the impedance of the circuit into account; if the resistance of the circuit is, as usually happens to be the case, small in proportion to the reactance, the latter can be taken instead of impedance, again simplifying the calculation.



The reactance of most electrical machinery is given as a percentage, which may be defined as the *voltage drop produced in the machine by the passage of its full-load current expressed as a percentage of its open-circuit voltage*, while the constants of cables and overhead lines are usually expressed in ohms.

Before these can be combined in any calculation it is essential either that the former shall be converted to ohmic values or the latter to percentages, but if the conversion to percentages is decided on, all the percentages must be to a common basis. For instance, a generator may have a reactance of 10 per cent. at a full load of, say, 25,000 kVA, and a cable or transformer fed by it of 5 per cent. at a full load of 7,500 kVA; then the cable or transformer reactance must be increased to a percentage at 25,000 kVA, *i.e.*, 5 per cent. $\times 25{,}000/7{,}500 = 16.67$ per cent.

The writer has found that the most convenient method is that based on reactance and resistance expressed as percentages, and that the best common base to which all percentages should be increased or decreased is 100,000 kVA, *i.e.*, by assuming that all plant has a nominal rating of that amount.

Some Practical Examples

In the diagram is shown a typical lay-out of a portion of a high-voltage system, made up as follows:—

(*a*) Two 10,000-kW generators at 0.8 P.F. (*i.e.*, 12,500 kVA) and 10 per cent. reactance.

(*b*) A 25,000-kW generator at 0.75 P.F. (*i.e.*, 33,333 kVA) and 12.5 per cent. reactance.

(*c*) An 11,000/22,000-volt, 12,500-kVA transformer with 10 per cent. reactance.

(*d*) A 22,000/11,000-volt, 12,500-kVA transformer with 10 per cent. reactance.

(*e*) A length of 22,000-volt cable of a nominal rating of 12,000 kVA and resistance of 0.51 ohm. and reactance of 0.39 ohm.

(*f*¹) and (*f*²) Lengths of 11,000-volt cable of a nominal rating of 5,000 kVA and a resistance of 0.91 ohm. and reactance of 0.44 ohm.

(*g*) An 11,000/400-volt, 7,000-kVA transformer with 8 per cent. reactance.

Adjusted to a percentage voltage drop at 100,000 kVA the above data become (*a*) 80 per cent. reactance per machine; (*b*) 37.5 per cent. reactance; (*c*) 80 per cent. reactance; (*d*) 80 per cent. reactance; (*e*) 10.5 per cent. resistance and 8 per cent. reactance; (*f*¹) and (*f*²) 75 per cent. resistance and 36 per cent. reactance; (*g*) 114 per cent. reactance.

Having obtained these figures on a common basis the short-circuit kVA at any point on the system can now be found with a minimum of trouble. Leaving out of account for the moment values of resistance, it becomes obvious that the only reactance between the generators and the power station busbars is that due to the inherent reactance of the machines themselves, *i.e.*, (*a*) and (*b*), which when added together reciprocally is 19.37 per cent.; a short circuit on the main switchboard is therefore $100{,}000 \times 100/19.37 = 516{,}500$ kVA.

To find the possible short circuit at any point the value of all the reactances is added, directly if in series, and reciprocally if in parallel.

For instance, the short circuit possible at "X" with both the 11,000-volt and the 22,000-volt feeders in commission is arrived at thus:—

Reactance of (*c*), (*d*), and (*e*) = 80+80+8	=	168%
,, of (*f*¹) and (*f*²)	=	36%
therefore combined reactance equals 1/(1/168+1/36)%	=	29.6%
Adding generator reactance	=	19.37%
Total reactance	=	48.97%

Short circuit kVA at "X" is therefore = 100,000 kVA $\times$ 100/48.97 = 204,000.

If (*f*¹) and (*f*²) were not in commission the total reactance would be 168%+19.37 = 187.37%, and the short circuit kVA would be 100,000 $\times$ 100/187.37 = 53,400 kVA.

Similarly by the simple means of addition and multiplication the possible short circuits at any point can be found.

Modification Due to Resistance

If it is considered necessary to bring the percentage resistance into account, it can be regarded as being a further percentage in series with the reactance percentage but electrically at right angles to it. For instance, in obtaining the possible short circuit at "X" the resistances of (*e*) and (*f*¹) and (*f*²) are added reciprocally, *i.e.*, $1/(1/10.5+1/75) = 9.21\%$ and then vectorially to the total reactance thus: $\sqrt{(48.97^2+9.21^2)} = 49.8\%$, when the possible short circuit becomes $100{,}000 \times 100/49.8 = 200{,}500$ kVA.

Supply from an Outside Source

A further use of the above method has, is in computing the effect of a supply from an outside source feeding in at any point, for instance, a supply to a selected station by the Central Electricity Board. Assuming that a bulk supply is delivered to the system at the power station as in the diagram and that the short circuit due to that supply alone on the busbars is known to be 500,000 kVA, then the total on the busbars will be 500,000+516,500 = 1,016,500 kVA corresponding to 9.84 per cent. reactance. This figure must now be used in place of the previous figure of 19.37 per cent., which was taken as the combined reactance of the machines in computing the possible short circuits on other parts of the system.

Effect of Extension to System

Needless to say, an extension to a system will make no difference to the value of the possible short circuit between the power station and the point where the extension starts, but it will always be necessary to know what class of switchgear to instal at the far end of the extension.

On the diagram an extension has been shown in dotted lines. It has been found that the short circuit at X is 204,000 kVA by using reactance only, and that therefore the reactance is $(100{,}000/204{,}000) \times 100\% = 48.97\%$. If the reactance of the extension is, say, 76 per cent. (on 100,000 kVA basis), then the total reactance up to the new sub-station busbars is 48.97+76 = 124.97 per cent., and the possible short circuit will be 100,000 $\times$ 100/124.97 = 80,100 kVA.

From the foregoing it can be seen how simple a matter short circuit calculations can be made by the adjustment of all reactance and resistance values to a common base, and that once this is done for a system, however large and complicated that system may be, an easy calculation brings as its result a direct figure of kVA without any further tedious conversion to and from ohms, volts, and amperes.

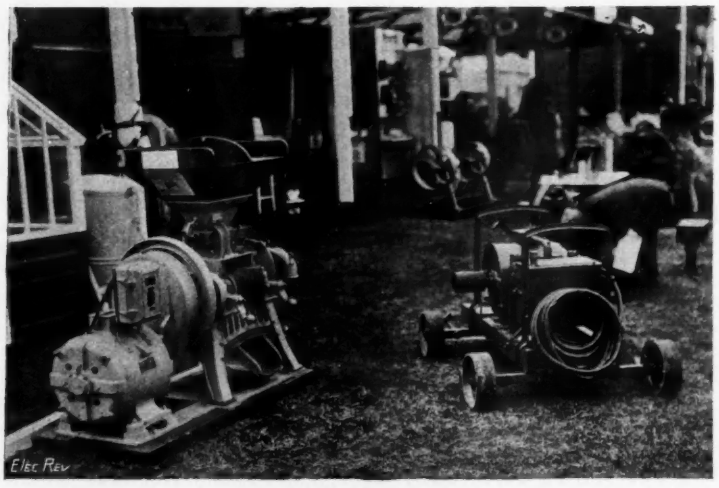
* The term "decrement" is used to denote the falling away of the fault current from its maximum value to a sustained value during the one to two seconds following the fault.

The Royal Agricultural Show

The British Electrical Development Association co-operates with manufacturing and supply companies to advocate rural electrification

A FEATURE of the Agricultural Show which was held at Warwick last week was the increased interest shown in electrical equipment for the farm.

One of the principal exhibits of electrical interest was the stand of the British Electrical Development Association, on which practical demonstrations of the many uses of electricity on the farm and in the home were given. These demonstrations were made possible by the co-operation of the Shropshire, Worcestershire and Staffordshire Electric Power Co., the South Wales Electrical Power Distribution Co., and the North Metropolitan Electrical Power Supply Co., who sent their demonstration vans for this purpose. The Association



The G.E.C. Display

issued a handy plan of the show with all the more important stands which showed electrical equipment marked in red. This made one think that by a little co-operation all these stands might be got together in one block for a future exhibition and so make an even better impression on the public and farmers in particular, as to the strides that electricity was making and its great possibilities. Though a little crowded, the stand was a most interesting one, and included samples of apparatus suitable for the farmer made by many manufacturers. The exhibits displayed were comprehensive, including apparatus for the poultry farm, such as incubators, foster mothers, &c., dairy equipment, water pumps, mowing and grinding machines, sheep shearers, horse clippers, and an extensive range of domestic appliances. The Leamington and Warwick undertaking provided electricity free of charge.

On the stand of the General Electric Co., Ltd., were displayed the many uses to which "Witton" electric motors can be applied. These included a portable motor, rated at 15 h.p., suitable for driving threshing machines, a 5-h.p. portable motor for general use about the farm, and other motors driving the familiar countershafting and different barn machinery. For the first time in the ninety years of the existence of the Society an award has been made for an electric motor. The entry was of a portable 5-h.p. electric "Drumotor," made by the G.E.C., which has recently initiated a special agricultural department to deal with the requirements of farmers. The general design of the motor is similar to that of a cable drum (but constructed of sheet steel) with a projecting two-step pulley at one side. A 60-ft. length of heavy cab tyre sheathed cable is coiled around the drum when not in use—a recess being provided to take the plug. Within the body of the drum a standard non-protected 5-h.p. motor and a push-button starter are enclosed. Ventilation is secured by inlets in one cheek of the drum and outlets in the other (which is made in a hollow form for the purpose). A cover at one side exposes the push-buttons when it is desired to start or stop the motor. The 3-phase, 50-cycle, 400/440-volt motor runs at 960 revolutions per minute, and hence is suitable for direct belt drive on to most farm machines. It is of the squirrel-cage induction type with cast aluminium alloy rotor, fitted with ball and roller bearings. It is of particularly robust design, and is specially suitable for the rigorous conditions under which it may have to work on a farm. The starter is an air-break, ironclad, three-pole contactor circuit breaker with no-volt and three over-load trips and self-contained "start" and "stop" buttons. This motor is particularly easy to transport from place to place on a farm even on soft and rough ground, as the flanges are of comparatively large diameter. As it can be turned in its own length, it is quite easy to get it through doorways and along passages. Collapsible feet are incorporated on one side for holding the motor in position when driving. The underside of the feet is formed with steel point grips; alternatively separate belt-covered non-slip shoes can be fitted according to the nature of the surface of the ground upon which it is placed. One man can roll the motor into position and line up the belt without difficulty (a long lift handle is provided to facilitate this operation). While the motor will work quite satisfactorily with its own weight, when delivering its rated output, for overload purposes it is advisable to insert a piece of timber between its feet and its work to maintain the tightness of the belt.

For the poultry farmer the company had an extensive display showing how electric lighting should be installed for the purpose of increasing egg production. Radiant heat hovers, egg testers, &c., were also exhibited. Of interest to the horticulturist was a greenhouse heated and ventilated by electricity, and also an example of how intensive lighting can be used to promote and control plant growth. Bottom heat was supplied to a garden frame by means of special electric soil-heating cable. An ultra-violet ray lamp was also shown for use on cattle, horses, chickens, and in some cases on plants.

In addition to the apparatus for farm use, a wide range of "Magnet" household electrical appliances suitable for the farmhouse were exhibited. These included an electric cooker specially designed for use in rural districts, refrigerators, suction cleaners, wash boilers, storage water heaters, fires, &c.

One of the difficulties encountered by the farmer who wishes to use electricity is how to apply it. This year he had wonderful assistance in this respect, for five of the stands were veritable object lessons in the applications of electricity to farming. These exhibits, in addition to the stands already mentioned, included displays by J. Harrison & Co. (Liverpool), Ltd., and Bull Motors, Ltd., while a very fine joint display was staged by the Leamington and Warwick, the Leicestershire and Warwickshire and the Midlands Electricity Supply Companies.

The accompanying illustrations show the G.E.C. stand and electrical appliances exhibited on other stands.

An event which attracted a large audience at the show was an address on the uses of electricity on the farm, including modern methods of dairy and poultry farming, by Mr. M. M. Harvey, agricultural development officer of the Shropshire, Worcestershire and Staffordshire Electric Power Co., on the occasion of the E.D.A. conference at the show. The lecture aroused considerable interest and gave rise to an informative discussion.

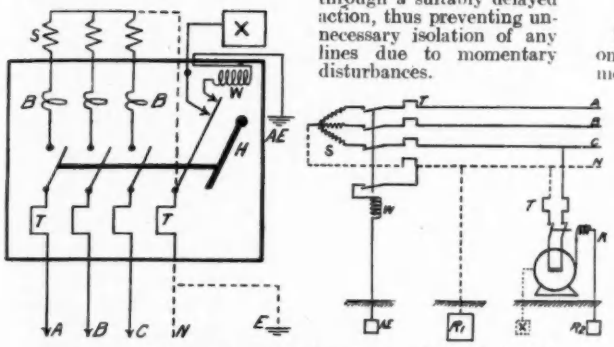
This is the third agricultural show this year in which the Electrical Development Association has taken part, the previous occasions being the Bath and West Show, held in Bristol, at which the Association's exhibits included an all-electric bungalow and dairy, and the Highland and Agricultural Society's Centenary Show, held at Edinburgh in June, in which the Edinburgh Corporation Electricity Department, the Lothians Electric Power Co. and the Scottish Southern Electric Supply Co. co-operated.

Electrical Appliances at the Agricultural Show

Installation Protection. By T. C. Gilbert, A.M.I.E.E.

How a Large Continental Power Company has Solved the Problem

IN a previous article* the inadequacy of the usual protective methods in rural conditions was demonstrated. In Germany the Rheinisch-Westfalisches Elektrizitatswerk (R.W.E.) has solved the problem by the installation of extremely interesting protective devices, both at sub-stations and also on consumers' premises. The sub-station device is essentially an ordinary air-break overload circuit breaker, with ratings from 15 to 350 A at 500 V, but it has in addition two unusual features which effect protection by what is termed "artificial earthing." In addition to the three-phase overload trips, which are primarily thermally operated with an electro-dynamic quick release for heavy faults, there is fitted a neutral potential trip and a further thermally-operated release to the neutral. The former consists of a high-resistance coil connected between the neutral and an artificial earth connection—which is additional to the main station earth; the coil operates an electro-magnetic release through a suitably delayed action, thus preventing unnecessary isolation of any lines due to momentary disturbances.



Now, this potential trip has been very carefully designed, in that the actual leakage current required to open the switch is no more than 15 to 20 milliamps; this was found necessary for several reasons, one being that, as the artificial earth connection possesses considerable resistance and it was desirable to prevent the neutral attaining a higher potential than 40 volts, the operating current could not be large. As it is, the artificial earth connection may possess any resistance up to about 500 ohms without in any way upsetting the action of the device; as the operating current is 15 milliamps only, every additional 100 ohms in the artificial earth connection will result in an addition of only 1.5 volts upon the neutral before the release operates.

Briefly, the action of the potential trip is as follows: As soon as the neutral attains a potential approaching 25 volts, due to the passage of a fairly heavy current over the main earth connection, a small current will flow through the trip coil to the artificial earth connection, this being in parallel with the main earth. As soon as this current reaches an intensity of about 15 milliamps, probably representing a maximum potential of 40 volts upon the neutral, the circuit breaker is opened. The neutral is then disconnected from the artificial earth, but not from the main earth, and all protected units in the sub-station are also disconnected from the neutral, but the neutral otherwise remains continuous as before.

Connections of Switch

This will be rather more clearly seen in the diagram of internal connections shown above.

In this diagram S represents the transformer secondary, with B and B magnetic blow-out coils and T and T the thermal overload releases, one to each phase. (It will be noted that a thermal overload release is indicated in the neutral also, and this will be explained later.) The protected station units are shown at X, W is the potential trip coil, AE is the artificial earth connection and E the main station earth. The handle for operating the switch by hand is shown at H. The outgoing lines are A, B, C, and N. It can be followed from this diagram that the neutral is not broken by the action of the switch, nor it the neutral disconnected from the main station earth at any time.

The action of this trip is delayed by an ingenious arrangement of balance weights, which are shown in the illustration of the interior of the switch. The adjustment of these weights also allows selected potential values to operate the trip. The action of this potential trip ensures complete disconnection in all cases where fairly heavy currents are flowing over the station main earth, the resistance of this earth connection preventing disconnection by means of the overload devices at the sub-station and resulting in a potential upon the neutral. This would at *all* times prevent the neutral conductor rising above a certain pre-set potential depending upon local conditions. It will also effectively guard against too high a potential being supplied to single-phase appliances due to disturbances in the overhead lines.

The thermal overload release in the neutral effects early disconnection in cases of contact between phase and neutral. This thermal release is usually set to come into operation at a nominal current amounting to about 20 per cent. of the maximum load of a phase conductor.

A sub-station switch equipped as described above with phase overload releases, neutral overload release, and neutral potential release will effectively protect rural consumers against any serious consequences likely to follow the line faults mentioned. We have not, however, completely safeguarded the consumer against the effect of a break in the neutral with the broken end clear of phase or earth. The earthing of the far end of the neutral, in addition to the sub-station end, would afford this protection, but there might be objections to this step.

Protection on Consumers' Premises

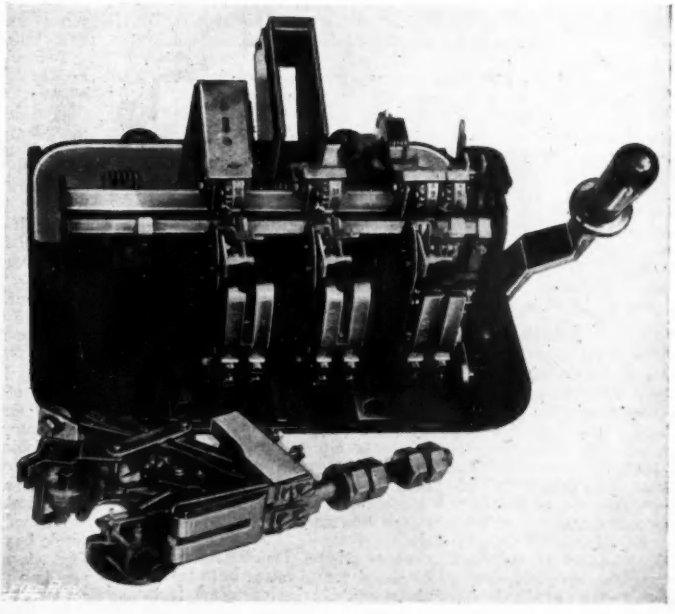
The R.W.E. has, therefore, devised apparatus for use on the consumer's installation to cover all possible requirements, but it will, in the case under examination, take the form of a single- or three-phase motor protective switch, in addition to the sub-station switch.

The sub-station switch is shown on the left of the diagram, and the motor protective switch (single-phase in this case) on the right. At the sub-station end, S represents the transformer secondary, T the thermal overload releases, W the coil operating the potential release, and AE the artificial earth connection. The station main earth is again represented by R.

In order to guard against the potential of the motor casing (and the associated machine if the motor is metallically connected thereto) together with the starting or other switches, exceeding 40 volts, due to current leakage in the motor itself or due to line disturbances, this special motor protective switch is equipped with thermal overload releases, backed up by magnetic quick-acting releases (T), and a potential trip (K). Unlike the potential trip in the sub-station switch, however, the potential release in the motor switch is instantaneous in its operation, the necessary leakage current being 15-20 milliamps at 25 volts. As in the case of the sub-station switch, the artificial earth connection (R2) may possess a resistance up to about 500 ohms without in any way vitiating the protection afforded to machine and operator. Obviously, the better the earth connection the better the protection, but these devices have been designed for use in situations where good earth connections are notoriously difficult to obtain. In addition, this earth connection is constantly checked, as the action of the stop-button on the motor switch trips the switch out by placing a small artificial leakage current over the trip coil down to the artificial earth, thus ensuring continuity, and giving early indication of any failure in this direction.

The fact that both the trip coil and the earth connection are thus constantly under observation ensures that they are not likely to fail in emergency as is so often the case with protection by earthing as generally practised in this country.

It will be noted from the diagram that, even if a further earth connection, intentional or accidental, shown at X with dotted connection, be in existence, yet the action of the protective trip is not thereby rendered inoperative. It still remains



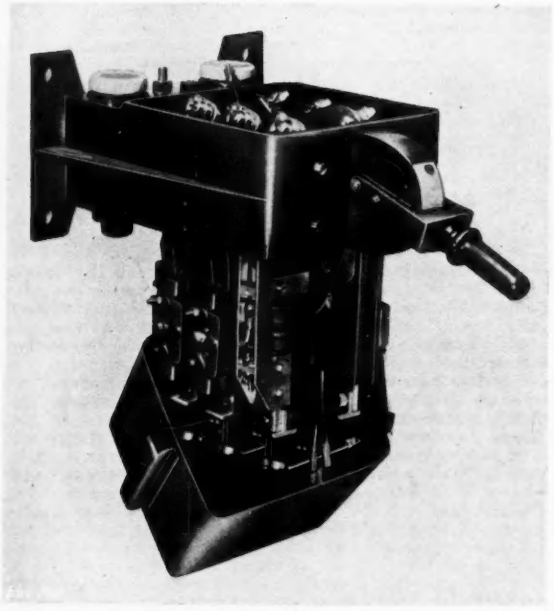
* "Rural Distribution Problems," ELEC. REV., July 10th, 1931.

impossible for the potential upon the protected motor casing to rise to a value approaching 40 volts without providing sufficient current to operate the leakage potential release at K.

In addition to the excellent protection afforded to the operator by the leakage potential release, the fact that so small a current as 15-20 milliamps is sufficient to operate it allows incipient faults in the motor itself to be detected and rectified before they can assume serious proportions. The protection afforded may therefore be said to be unique.

Both the sub-station switch and the motor protective switch as described above form part of the celebrated " Sbik " range of protective apparatus. It is gratifying to note that this apparatus is now beginning to make its appearance in this country, and in the interests of safety it is to be hoped that its more general application will follow. The devices incorporating this principle range from the 350-A sub-station switch down to the domestic switch plug.

With fuses it is immediately obvious in which conductor the break has occurred, but with a circuit-breaker that disconnects all poles this is not the case. The " Sbik " switch is therefore fitted with five numbered indicators; four are visible in the illustration on the previous page, the fifth being on the dissembled action. They are fitted one to each of the phase overload releases, one to the neutral overload release, and one to the neutral potential release; the indicator of the particular release causing the opening of the switch advances one point, thereby affording an immediate indication of where the fault lies. Also, the repeated occurrence of the same fault is automatically logged, and as the indicators are visible through windows provided in the front of the iron case, the switch does not have to be opened for investigation.



The thermal overload releases are interchangeable, and one switch may be used for the range 15-30 amperes to 150-200 amperes, and there is another for the range 30-60 amperes to 280-350 amperes, the overload releases being adjustable within their capacities by means of the milled screws and dials shown at the bottom of the action. It will be noted that in the illustration the phase overload releases have a capacity of 60-120 amperes, and the neutral overload release 15-30 amperes.

The delayed-action mechanism and operating coil of the neutral potential release is just visible at the top right-hand corner of the illustration, and close examination of the loose action will show that all contacts, whether main or auxiliary, are renewable. The ultra-rapid electro-dynamic rapid release is clearly seen in the loose action as a shunt surrounding the bimetal thermal release, and its action is simple and effective, being due to the mutual attraction and repulsion of the heavy currents flowing over the bimetal strip and the surrounding shunt. Disconnection is within 1 to 1½ periods of the supply by the rapid release on heavy faults.

Advantages of Thermal Releases

The protection of overhead lines and motors by means of thermal overload releases is probably the most efficient way in which this essential protection can be applied, in addition to being scientifically correct. Unlike fuses and magnetic releases, thermal releases will deal with low overloads, not immediately dangerous, but likely to become so if allowed to continue indefinitely. Also, in the event of heavy, but short duration, overloads, which would be cut out at once by fuses or magnetic circuit-breakers, a certain latitude is allowed. Magnetic breakers with additional thermal time lag are generally unnecessarily complicated.

With thermal overload releases there is, therefore, no unnecessary interruption of the supply, and immediate restoration of the supply is possible provided the overload is not excessive.

With motors, overload protection by thermal releases has equal advantages over fuses or magnetic breakers, which usually have to be " set up " to such an extent to cope with heavy starting currents that they afford little or no protection under normal running conditions. The abuse of fuses leads to great damage to motors under unskilled supervision, as it is not generally realised that it requires an overload of about 40 to 50 per cent. to effect isolation by fuses, whereas most motors are damaged by continuous overloads of about 15 to 20 per cent. This often leads to the installation of a motor larger than would be required with efficient protection, and in addition there is the risk of single-phase running if disconnection is not effected on all poles simultaneously.

Three releases are visible on the contact supports in the last illustration; the two at the back are two thermal overload releases, on two phases, with their adjustments and adjusting scales visible also. The loose armatures of the magnetic releases which back up these thermal releases are seen above the adjusting scales. The coil on the front contact leg is that operating the leakage potential trip, but, unfortunately, the testing-button for this, which is also the stop-button for the motor, cannot be seen as it is located behind the operating handle in the illustration.

In an article in the ELECTRICAL REVIEW recently, an engineer, who evidently had considerable knowledge of the operation of a.c. motors, asked for a direct-on-line starter with overload releases on all three phases. The " Sbik " motor switch can be equipped with three overload releases if required.

It will be noted that all contacts are oil-immersed, there are two breaks per phase, all contacts are renewable, and the adjustment of the low-voltage coil can be seen at the top centre of the action. Although for their own protection a.c. motors do not require either low-voltage or no-volt coils, yet it has been found necessary to fit these in order to protect operatives against unexpected starting after disconnection of the supply for any reason.

I have been assured by German engineers that the cost of both the sub-station switch and the motor switch is no more than that of equivalent quality gear without the special protective features described. These special devices are so extensively used abroad that they are now quantity produced, to the almost complete exclusion of the ordinary sub-station gear and consumers' apparatus on many supply undertakings. Supply undertakings utilising these devices seem to effect extremely perfunctory earths, whereas we in this country go to considerable expense, without conspicuous success, in obtaining low-resistance earths.

In a recently published book,* the above problems have been discussed in a much fuller way and from a more theoretical point of view.

Inadequacy of Present Regulations

In conclusion, I should like to quote a few examples of accidents due to the failure of protective devices taken from the records of the supply undertaking concerned.

Two instances were due to inadequacy of the earthing system which would have complied with our own I.E.E. Regulations. In the first case, metallic conduit sheaths were earthed to a fairly extensive water supply system on a farm; an insulation fault arising one day made alive the entire water system, but its resistance proved to be too high to blow the main fuses, and a potential gradient arose in a stable where the water pipe entered the ground. Six cows within the area of this gradient were killed and several others injured by their struggles. In the second case, a 1½-h.p. squirrel-cage motor in a laundry, a building separate from the stable, was earthed to an earth plate in the ordinary way. Connection was also made to the steel framework of the building from the earth system, and a slight leakage to the frame of the motor failed to blow the protective fuse, with the result that a bull tethered by an iron chain to a stanchion in the stable, was killed.

Two other bad examples were due to the failure of neutralisation to effect safety. In the first case, the wind caused contact between one phase and neutral conductors and the sub-station fuse did not blow. *Thirty-seven* installations at once were placed at a dangerous pressure above earth, as all apparatus was connected for protection to the neutral, in accordance with the then existing regulations. Accidents occurred on every one of these installations, and many cattle were killed; luckily the fatalities were not extended to human beings, although many persons handling water taps and pumps received severe shocks. Under similar circumstances in another district a thorough-bred horse was killed, as was a labourer standing on top of a heap of turnips, by coming into contact with a metallic conduit of a *sound* installation.

In the last case that I shall quote, the neutral conductor of a supply line came into contact with a phase conductor, caused by the falling of a tree branch. The internal installation was connected to the neutral for protection, and connection was made between the wiring system and the steelwork of a cow shed. Owing to line or earth resistance, the line fuses did not blow, and 12 cows, tethered to the steelwork of the shed, were killed outright, and 16 others died of injuries. Although in every case quoted the neutral conductor was apparently well earthed at the sub-station, yet this proved to be completely inadequate to effect isolation under common fault conditions.

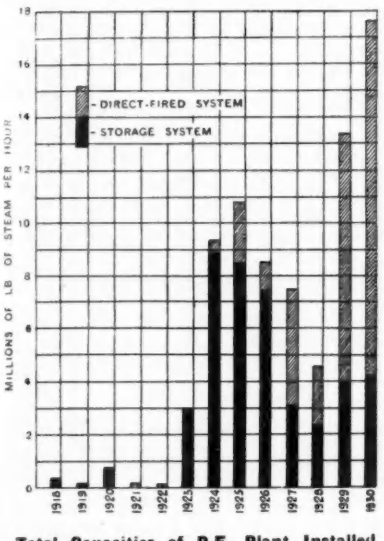
The solution of the problem is simple for us, as the spade work has already been done, and the price paid, abroad; the first step is to awaken a realisation of the existence of the problem.

* " Rural Electrification," Alfred Ekstrom, D.Sc., M.I.E.E., and Vidar Ekstrom.

Pulverised-fuel Firing in the U.S.A. By Vernon Walker, A.M.I.E.E

The trend of development is decidedly in favour of the Unit System

THE report of the Prime Movers Committee has been issued for the year 1929-1930 by the National Electric Light Association of New York. During the year 1929 pulverised fuel was installed on approximately 70 per cent. of the coal-fired central station plant, either constructed or completed during that year. During the year 1925 the average evaporative capacity of the powdered-fuel fired boilers installed in central stations was 113,000 lb. per hour per boiler; during 1929 the comparative figure had risen to 386,000 lb. per hour per boiler, an increase of 241 per cent. The accompanying diagram shows the total hourly evaporative capacity of all powdered-fuel fired boilers installed in public utility stations for each year since the adoption of powdered fuel, and the comparative capacities equipped for the direct (unit) or storage systems. Of the total capacity constructed or completed in 1929, 70 per cent. were fired by the unit system, and it is apparent that if the present trend continues, the central system will be used only to a very small extent for large public utility stations. The total first cost of the unit system is slightly lower than that of the central system, and a greater output is obtained per unit volume of boiler and preparation plant. From the general data collected it is evident that equal performance, efficiency, availability, and operating costs can be obtained with either the storage or direct systems, with a net saving in fixed charges favouring the unit system. The majority of boilers are now fitted with water walls which average 8 per cent. of the boiler heating surface in the case of the central system and 13 per cent. of the boiler heating surface of the direct system. Difficulties in unit firing chiefly comprise inconsistent sizing of coal over a wide range of capacity, and the quantity of primary air required for the best burner conditions is not always the best suited for maximum efficiency in milling.



Total Capacities of P.F. Plant Installed in U.S.A.

CO_2 Content and Stack Losses

The excess air admitted to the furnaces is generally kept constant at 20 to 30 per cent., giving a CO_2 content of 14 to 15 per cent. Tests indicate that as the CO_2 content is raised, the stack loss decreases and the combustible in ash loss increases, so that between 14 and 15 per cent. CO_2 the one offsets the other, the efficiency changing very little. Below 13 per cent. CO_2 the decrease in fly ash loss is not as great as the increase in dry gas loss. If tube slagging occurs, it is advisable to increase the excess air with the output to relieve the situation. The average time required to bring a cold boiler to range pressure averages some 400 minutes for the central and 70 minutes for the unit system. Apparently the minimum coal feed used with the direct system is somewhat higher than that of the central system, and again the central system covers boilers of a larger water capacity. An average of 38 minutes is required to bring a warm boiler up to line pressure with the storage system, and 20 minutes with the direct system. For both systems the time ranges from half an hour to as much as 24 hours to bring a cold boiler up to pressure. More attention is being given to oil-burning equipment for lighting up and bringing boilers on to line, and in some cases permanent oil-burning equipment is installed at each burner.

Mill drying by flue gas is being adopted by some stations with satisfactory results. Gas at 550 deg. F. is taken from the entrance to the air heater in one case, maintaining approximately 12 per cent. CO_2 in the mill piping. By venting 25 per cent., 3 per cent. moisture is easily removed, and by venting 55 per cent. and using gases at 700 deg. F. 7 per cent. can be removed. The gain in efficiency by reducing the flue-gas loss of the boiler is about half per cent.

The availability of boiler-house-use factor averages 46 per cent. for the central and 35 per cent. for the unit system. This factor includes the time when the boiler is either steaming, banked, or standing cold, ready for service, against the total hours in a year. In the case of some individual units the factor is as high as 92 per cent. Routine outages for overhaul and cleaning are made once a year by the New York Edison Company, twice a year by another large power company, and in other cases every 1,500 to 1,800 hours.

Importance of Proper Design

The importance of proper furnace and burner design to meet the requirements of high capacity, high availability and high efficiency, with smokeless combustion over a wide range, together with low maintenance costs and ease of ash removal, is being generally recognised. Gas velocities at the entrance of the boiler tubes are being reduced, and cooling the ash particles by means of water-walled surfaces or slag screens in front of the first pass has met with success in decreasing tube slagging when using coals of a low ash-fusion temperature. Slagging difficulties are generally traced to a combination of high percentage of coarse coal, high furnace heat liberation, and low ash-fusion temperature. There has been a tremendous advance in the use of protected water-tube walls for combustion chambers, and one firm states that of the orders received for powdered-fuel fired boilers 100 per cent. have some part of the furnace fitted with protected tube walls; 23 per cent. of these have tubes on three of the walls; and 68 per cent. on all four walls. The metal block covered water-cooled ash hopper has proved to be most satisfactory for the removal of ash in the dry state, and this is shown by the fact that it has been embodied in 70 per cent. of the above boilers, while some 16 per cent. use the slag tap method of ash removal.

Some difficulties have been experienced in the development of a suitable bottom for the slag-tap type of furnace, in which the slag is tapped from the hot bottom of the furnace through a water-cooled slag spout about twice a day, requiring one and a-half to four hours for the operation. Difficulty has been experienced in getting the slag to flow from the hot bottom at low steaming rates, but not on full load. This has been overcome in certain cases by placing small auxiliary burners on either side of the slag spout and at such an angle that the flame from these will play on the hot bottom near the mouth of the spout to assist in keeping the slag sufficiently liquid to flow out of the spout even at low boiler ratings.

In one instance an installation capable of evaporating 270,000 lb. of water per hour is equipped with a furnace of complete bare tubes of fin design, with horizontal burners used in conjunction with a slag pit. This unit has been in service since 1929, and it shows the possibility of the use of the slag-tap furnace with bare tubes. One of the advantages of this type of furnace is the low combustible in the refuse. Of 79 samples of slag taken from 10 different furnaces, the average carbon content was only .14 per cent. The average heat liberation of the furnaces of the central system is 18,800 B.th.u. per cu. ft. per hour, the corresponding figure for the unit system being 23,400 per hour. The lowest heat liberation occurs with refractory walls and non-turbulent burners, the highest figure with water-cooled walls and turbulent burners. The flame length averages 37 ft. for the unit system and 51 ft. for the central system.

Development in England

With regard to English development in 1930, three large boilers capable of evaporating 270,000 lb. per hour are being installed at the Ironbridge power station of the West Midland Joint Electricity Authority; these boilers have a heating surface of 21,600 sq. ft., an area of 3,900 sq. ft. of water-cooled walls, and are fired by six Calumet burners per furnace. The furnaces being fitted with Bailey blocks, three Fuller Lehigh mills working on the unit system are provided for each boiler. At the Clarence Dock power station of the Liverpool Corporation four large steam-raising units which have been erected are served by a combination of chain-grate and pulverised-fuel firing. The main evaporation is due to the chain grate, the powdered-fuel burners situated in the side walls being capable of boosting up the evaporation by 25 per cent. The boilers will evaporate 176,000 lb. per hour on overload.

Marine development has been somewhat disappointing during the year. The most noteworthy ship which has been specially designed for operating with pulverised fuel is the *Berwindlea*, of the Berwindmoor Steamship Co., which has been engaged for the past fourteen months in continuous service between Havana and Newport News. The p.f. equipment was installed by Messrs. Clarke, Chapman & Co., a ring main distributor being fitted to the burners.

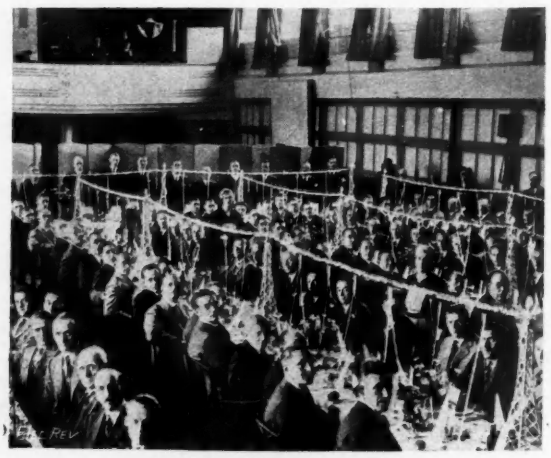
The Southern Railway is experimenting with the A.E.G. system of powdered fuel on one of its locomotives. The burners of this system are formed by a water-cooled trunk with vertical openings, one being placed at each side of the fire box. The coal is carried forward from the tender to the burners by an air pressure of 6 in. w.g. from a screw feeder. Very successful experiments have been carried out with this system in Germany, using brown coal of a very low calorific value.

A Radio Works Visit

The new season's range of "Gecophone" receivers and components are distinctly attractive in appearance and performance

LEADERSHIP is a distinction which is sought for eagerly by those who sell in such a popular market as that of wireless apparatus. That the General Electric Co., Ltd., is making a valiant effort to reach that goal, the resources it commands and the methodical character of the lay-out of its 10-acre factory left little room for doubt in the minds of even the most sceptical of the several hundred wholesalers and factors who visited Coventry last week to inspect the new line of products the company is introducing this season.

Each detail of manufacture and assembly receives its requisite share of care, large-scale production being a major factor in



Luncheon at the Magnet Club

providing the purchaser with excellent value for his money, and, since the company controls within its own organisation the design and manufacture of every component part of its radio sets, co-ordination of the various sections enables it to offer products of a high standard of quality.

A.C. Receivers

The new season's range of a.c. mains-driven receivers (100/250 volts, 50/80 cycles) includes a 3-valve set of assured range and selectivity, though only possessing a single stage of screen-grid h.f. amplification; the last valve is a pentode, the ebony black cabinet having a dull gold shaded front panel. The new self-contained table model has a built-in inductor dynamic loud-speaker, illuminated control dial, combined mains and wave-length change-over switch, gramophone pick-up, mains aerial device, and a handsome inlaid walnut cabinet.

The "table four" model is tuned by one knob, the only other operating control being for volume and is triple acting and serves both the radio and gramophone inputs. It incorporates a local-distant switch, mains aerial, illuminated dial calibrated in wavelengths, and an ingenious 5-position switch for wave-band changing, pick-up, and on-off switching. Substantially the same circuit is used for the console model, which makes a fine piece of furniture. The radio-gramophone set has 4 valves, the audio-frequency circuit having been carefully designed for really good reproduction. A new induction motor drives the turntable and is of ample power to obviate speed fluctuation; an automatic stop is provided which needs no pre-setting of the pick-up arm, and the speaker is housed in the lower portion of the graceful cabinet.

The "Osram four" constructor's kit is definitely superior to its predecessors. Simplicity of construction and operation are two of its strongest features. A mains outfit, supplied fully assembled, enables the kit to be built for a.c. operation and last year's "Music Magnet Four" to be converted also, furnishing grid-bias as well as anode and filament current. The rectifier is a U.10 valve and the smoothing circuit and output filter are generous.

"Superhet" and D.C. Sets

The new 200/250-volt d.c. mains receiver is a 4-valve screen-grid set whose power, range, and purity of tone are above the average of its type. The portable 4-valve battery receiver has undergone improvement in several respects. The loud-speaker in the lid is full-sized and a turn-table is provided, the case being made of mahogany or waterproof leather covered.

While not intended to be decorative the designers of the "all-wave" set have succeeded in producing a receiver that should be really useful overseas; it is already in demand at home. By means of coil changing the medium broadcast band as well as short waves can be covered, the range being from 13 to 720 metres. The set is, of course, battery operated and the circuit is designed on the supersonic heterodyne principle, three of the six valves being of the screen-grid type. The metal cabinet is made to withstand climatic conditions abroad; its interior and the components are dull nickel-plated and its exterior is finished with crystalline enamel.

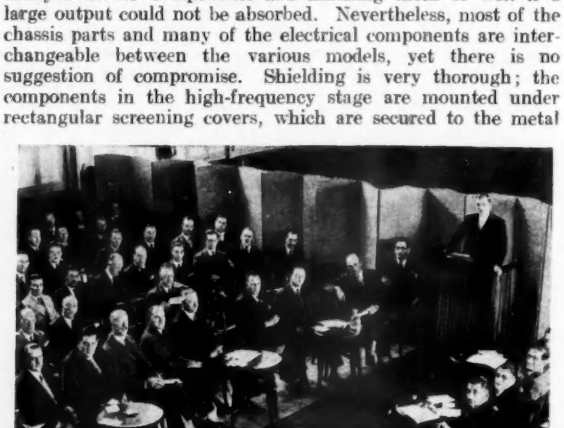
Speakers and Valves

Adjustable-armature "Stork" plaque and cabinet loud-speakers have been augmented by the addition of a new model; the cone is mounted inside a mottled brown cabinet of neat outline, which is made at the G.E.C. works at Birmingham and is probably one of the largest one-piece "Bakelite" mouldings made in this country. Moving-coil speakers are made for 100/260 volts d.c. and a.c., but a type which should become popular this season is the inductor dynamic (Farrand patent). When driven by a good receiver it is capable of a performance approaching that of the coil-driven type and needs no field excitation. Alternative tappings are provided to permit of this speaker being operated correctly with output valves of any impedance.

The "Osram" valves incorporated in all the sets referred to above are made at Hammersmith, London, and the company has decided to concentrate on the 2-volt class, though 4- and 6-volt types will still be obtainable. The range includes the DG.2 with a double grid for super-heterodyne sets and the GU.1 large output mercury-vapour rectifier. Screen-grid valves are obtainable with metallised glass bulbs on request.

Constructional Details

These sets are a striking illustration of the advantages of modern production methods, for it would obviously be uneconomical to install the necessary machinery for making so many intricate components and finishing them so well if a large output could not be absorbed. Nevertheless, most of the chassis parts and many of the electrical components are interchangeable between the various models, yet there is no suggestion of compromise. Shielding is very thorough; the components in the high-frequency stage are mounted under rectangular screening covers, which are secured to the metal



Mr. M. M. McQueen Outlining the 1931-32 Programme

base-plate underneath which are the smoothing equipment and switching mechanism, protected by a perforated sheetmetal cover.

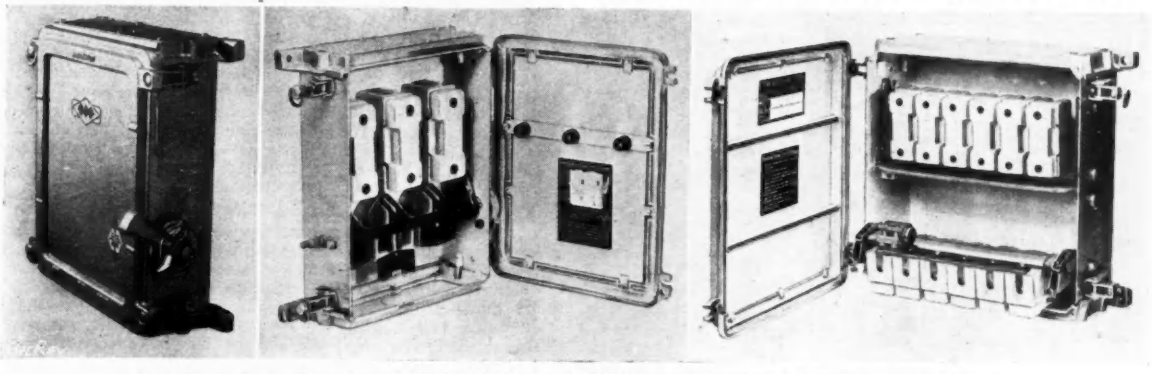
Particular care seems to have been taken to comply with all regulations and recommendations formulated for the safety of the user, while the controls are especially well arranged; they are mounted in a convenient manner, those most frequently needing manipulation being towards the front, and the tuning dials are calibrated directly in wavelengths. Sensitivity is amply adequate for most normal requirements, quality of reproduction is of a distinctly high order, and altogether the sets gave one the impression of being free from irritating inconsistencies. While being designed for large-scale production, the receivers are straightforward in arrangement and possess numerous detail features of interest which distinguish them from the commonplace.

Small Installation Accessories

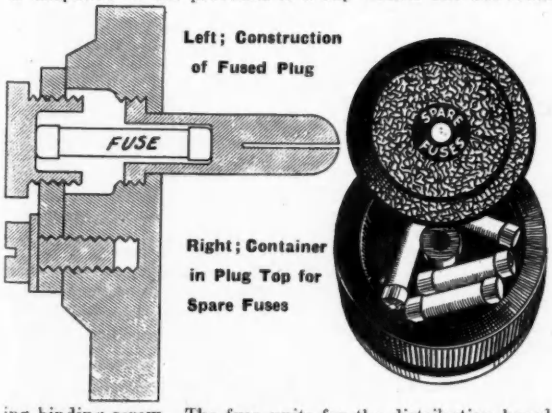
New Apparatus of interest to Contractors

Ironclad switch- and fuse-gear designed to comply with the requirements of the H.O., B.E.S.A., and the I.E.E.

THE new ironclad switches, switch-fuses and distribution boards just placed on the market under the brand-name "S.E.S.," are products of SIMPLEX ELECTRIC SWITCHGEAR, LTD., St. Andrews, Birmingham, a subsidiary company of Simplex Conduits, Ltd. They are made in a new factory which has been designed, built and equipped solely for their production. The cases are of the composite kind of wrought-steel and grey iron, with packed joints and gaskets in the covers, so that when closed they are watertight. The detachable end-plates are so provided with "knockouts" that the wiring is practically universal. They have exterior finishes of "Gallulose" (bright silver in appearance) which has been well proved as a rust-resisting medium, while the cases are lined with white porcelain enamel. The units may be secured by a small padlock without any additional attachment. The switch mechanism is of an entirely new reciprocating type, while the switch-blades are mounted on a bar of square-section solid bakelite. British-made vitrified steatite is employed for the switch bases which have self-aligning phosphor-bronze contacts shrouded by easily removable "Bakelite" shields. The fuse units are also of steatite, with stout copper blades and phosphor-bronze contact wings, and they are so designed that the entire length of fuse wire is enclosed between mouldings of a special arc-quenching medium. Renewal of a fuse wire is simplified by the provision of a cup washer and self-retaining binding screw. The fuse units for the distribution boards have a novel form of busbar connection strap, so that the fixing screw, while in electrical connection, is not required to act as a conductor. A special rotating main socket allows fuse banks of the boards to be hinged freely without imposing stresses on the main cables. Rubber blocks pressing on fuse handles maintain correct relative positions of the carrier and base for effective damping of the "arc." All the units have been designed with ample wiring space, while earthing terminals of adequate size are fitted. The sizes covered are from 15 to 100 A, 500 V, as d.p., t.p., and t.p. and neutral, the distribution boards being supplied with from 2 to 12 ways.



Exterior and Interior of "S.E.S." Switch-fuse and Distribution Board with one Fuse Bank Turned



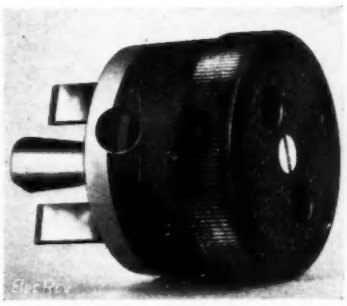
Left; Construction of Fused Plug

Right; Container in Plug Top for Spare Fuses

A 5-A fused plug for a 15-A socket; dual plug top to take 5-A plug; lighting fitting coupler.

The primary object of the "Wylex" 5-A fused plug recently introduced by GEORGE H. SCHOLES & CO., LTD., Blantyre Street, Manchester, is to provide for the connection of any small consuming device of up to 5 A to a standard 15-A plug connection. Cartridge fuses are employed and are housed in the plug pins, the construction of the cartridge being such that it is impossible for the layman to fix any but the correct fuse. A milled screw cap secures each cartridge. In the "Bakelite" top portion of the plug is a container for spare fuses, four being provided with each plug. Concise instructions as to the replacing of fuses are also to be found in the container. A further feature of this new and other "Wylex" plugs is the non-tracking material used for the base, a development of the company. A test certificate issued by the Manchester Corporation Electricity Department shows that four of the cartridge fuses were subjected to 1,000 A, 230 V, d.c., and that in each case the circuit was cleared quietly; a fifth fuse was subjected to 3,000 A with the same result.

The new dual plug top for the makers' standard flat-pin switch plug is designed to serve as a socket for the new 5-A fused plug. The sockets are extensions of the flat plug pins, and the plug holes in the "Bakelite" top are normally covered by a camera-type shutter.



Dual Plug Top

Fitting Coupler

The lighting-fitting coupler recently introduced by Messrs. Scholes is designed to permit the dismantling of large fittings without the usual tedious procedure of releasing screws, &c. It consists of a small moulded plug-and-socket connector to which is secured a metal suspension plate with two holes for the fitting and chain hooks.

An Automatic Oil-engine Station

A fully-automatic Diesel multiple-unit plant which is stated by *Power* to be the first of its kind, has been installed in the Hotel Chelsea, New York. Three 50-kV two-stroke sets, a 240-volt storage battery, a battery booster, a 240/120-volt balancer, and an automatic switchboard are contained in a basement room 23 ft. square with 8 ft. 7 in. headroom.

Starting and stopping are performed by adjustable load relays normally set to keep the load on each engine between 40 and 90 per cent. of the rating. When the load increases to 90 kW (or when the storage battery has discharged to a predetermined point), the first unit is started by motoring its generator from the battery. It immediately takes over the entire load and also recharges the battery, thus operating at something more than 40 per cent. capacity. At 45 kW the second set is started by its load relay. When the load increases to 90 kW the third goes on, reducing the load per unit to 30 kW, or 60 per cent. of the rating.

If the fuel, lubricating oil, or cooling water should fail, the engine fuel pumps are shut off, the engine is disconnected from the bus, and another unit is immediately put into service. At the same time an alarm is transmitted to the supervising office and a maintenance man is sent to correct the trouble. The storage battery has sufficient capacity to carry the entire load for a time. Similar protection is afforded if a unit should fail to start when required. The plant has been in continuous 24-hour service since last November. From March 14th to May 16th fuel used averaged one gallon per 10.66 kWh.

Induction Motors. By D. G. Sandeman, B.Sc., A.M.I.E.E.

A better use of active material in recent years has resulted in great reductions in weight and capital cost

THE magneto-motive force which produces the rotating flux in an induction motor is caused by the inter-action of the currents circulating in the phase windings. If the ampere-turns produced by a distributed winding be plotted, it is immediately evident that the slope of this curve over the conductors varies with their current. The m.m.f. resultant is obtained from the three-phase waves. It is composed of a number of gradients, or slopes, corresponding to the number of phases. A two-phase distributed winding will give a two-slope curve of m.m.f., a three-phase winding a three-slope curve, &c. It is quite a simple matter to draw the instantaneous curve of m.m.f. over a number of pole pitches in this way. If one or two curves are drawn showing successive intervals, it is evident that the m.m.f. curve travels forward at a speed of two pole pitches per cycle. It is also interesting from this simple construction to compare the curves for a full- and a short-chorded winding. Fig. 1 shows the motion of the curve of m.m.f. through an interval of 30 deg. Curves A are for a full pitch winding and curves B for a winding chorded 7/9 of the full pitch. Short-chorded windings are to be preferred, as these give a nearer approach to the sine wave. The machine suppresses all harmonics introduced by the sharp corners of the m.m.f. curve, and this all means losses. The total flux is of constant value and sweeps round the machine in a number of belts corresponding to the number of poles. The e.m.f. is in phase with this flux.

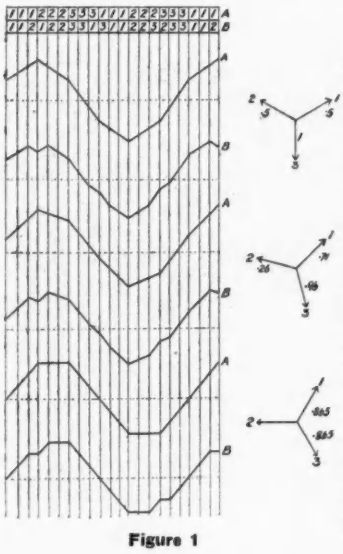


Figure 1

The Rotor Circuit

The next point to consider is the effect produced upon the short-circuited rotor. The conductors will have a voltage induced in them proportional to the rotor periodicity.

$V = K\omega$, rotor volts/rotor current = rotor impedance = $K\omega/\sqrt{R^2+\omega^2L^2} = K/L \sin\phi$, where $\cos\phi = R/\sqrt{R^2+\omega^2L^2}$.

This current may be represented in phase and magnitude by the arcs of a circle of diameter K/L or $V/\omega L$, see fig. 2.

This is the basis of the circle diagram. The stator carries ampere-turns at the full frequency which balance the rotor ampere-turns and supply the magnetisation, the whole diagram becoming as in fig. 3.

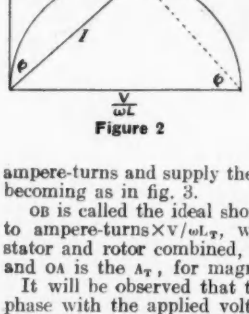


Figure 2

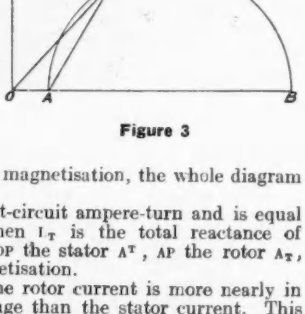


Figure 3

OB is called the ideal short-circuit ampere-turn and is equal to ampere-turns $\times V/\omega L_T$, when L_T is the total reactance of stator and rotor combined, OP the stator A^T, AP the rotor A_T, and OA is the A_T, for magnetisation.

It will be observed that the rotor current is more nearly in phase with the applied voltage than the stator current. This may be represented by displacing the stator and rotor ampere-turns by a small distance, see fig. 4.

The resulting ampere-turns produce the magnetisation. The flux is acted upon by a transverse m.m.f. in the air-gap region, which produces a skewing effect or magnetic drag.

High Starting Torque

The torque is proportional to the sum of the instantaneous products of rotor current and flux, or rotor volts $\times$ rotor amps. $\times \cos\phi$. When the rotor current attains its maximum value (at standstill) it is usually greatly out of phase with the rotor voltage, and for this reason, the torque at standstill is, in general, not the maximum torque. When it is desired to increase the starting torque of an induction motor, the rotor power-factor on short circuit must be improved. In the slip-ring machine external resistance is added, and any desired torque, not exceeding the maximum value, can be obtained. Sometimes a high-resistance squirrel-cage rotor is used giving good starting, but inefficient operation on load. These machines are sometimes used for lifts and cranes. Special squirrel-cage rotors are made which give a good starting torque without excessive loss on load. The operation depends on the difference in frequency between the starting and running condition. These machines are either made with a deep conductor or with two squirrel-cage windings, one at the air gap, and one below this winding, in a position of greater inductance. The outer winding, being a high resistance winding, gives a good starting torque, while the more inductive winding helps the efficiency on load. These motors have excellent characteristics, giving as much as 70 per cent. of full-load torque on the star position with 1½ times full-load current. The only drawback to high-torque motors of this kind is a small loss in power factor amounting to roughly 2 per cent., on full load, as compared with an ordinary squirrel-cage machine.

Effect of Leakage Flux

It is interesting to examine the actual curves obtained from an induction motor on test. With a small machine it is possible to obtain sufficient readings of amperes and power factor at different loads and at standstill to be able to plot the circle diagram. This curve becomes a sort of involute, as the inductance varies with the current loading. The reason for this is, of course, that the leakage flux is causing saturation in part of its circuit. The calculations in design are usually based upon the inductance which gives a correct value of full-load power factor. The tests show better overload and starting-torque figures, and poorer fractional load power-factor figures.

The actual shape of the curve of flux as revealed by the oscillograph is very interesting; at heavy overloads it becomes very distorted, and the rotor tooth ripple is very pronounced.

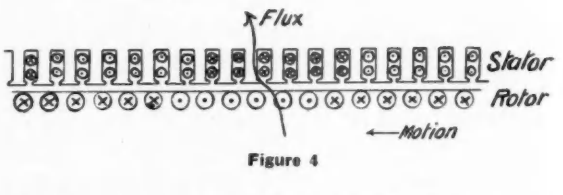


Figure 4

In the single-phase induction motor part of the magnetisation is supplied by the rotor currents, and the resulting field rotates at synchronism. When the rotor slips back with respect to the rotating field, currents will flow in the rotor bars nearly in phase with the flux, at low slip frequency. This gives rise to rotor ampere-turns at right angles to the stator turns and carrying a current at 90 deg. phase displacement. This condition is possible with either of the two equal rotating components of the single-phase field, and thus rotation can be maintained in either direction. Starting is usually effected by a starting winding displaced in position and carrying a current of different phase to the main current. Motors of this kind are sometimes very troublesome, as the starting torque is very small and acceleration is uncertain. They are, however, extensively employed for such purposes as small motor-generator sets, fans, polishing lathes, &c., where small starting torques are required.

The Single-phase Commutator Motor

A much more satisfactory machine is the single-phase induction motor started by means of a commutator. The brushes are earthed, giving a repulsion start, and as full speed is approached, a centrifugal device short-circuits the commutator segments. Motors of this type can give 2½ times full-load torque at start. Although an a.c. commutator and a complicated centrifugal device are used, motors of this type are very reliable indeed, and many makes are on the market.

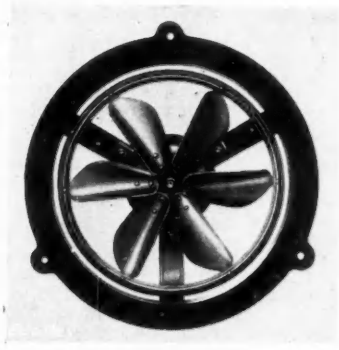
There are a few points which should be studied in the choice of a good induction motor. The efficiency is important in the case of a machine which is running up a large bill for current. Insulation is of the greatest importance particularly when the motor is to be employed in a damp steamy atmosphere. Some makers of small motor economise insulation in order to make better use of the cooling from the iron parts, others supply a low resistance rotor in order to keep the load temperatures down, and others again rate the iron parts too highly, giving a small machine with a very poor performance. These faults are not generally found in machines of British manufacture where a very high standard both of reliability and performance is maintained. The leading British manufacturers have spent large sums of money on research and it is principally due to them that our country has captured such a large share of the world's electrical motor trade.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Silent-blade Exhaust Fans

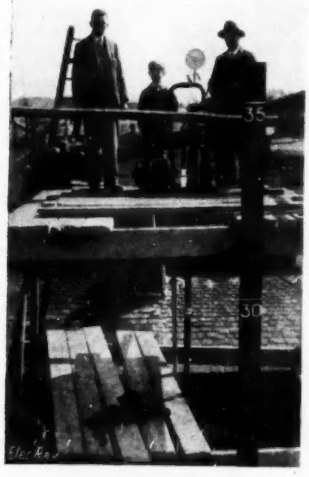
A range of "A S" exhaust fans recently introduced by MARELLI & CO., LTD., 19 and 20, Garlick Hill, Queen Victoria Street, E.C.4, employs a new type of 6-way propeller blade of special cross sectional formation, secured by a surrounding ring placed beyond and outside the working surface of the blades. The air displacement is appreciably increased and the consumption is reduced. Further, the construction affords silent and vibration-free running. The motor is of the induction-type, 4-pole, self-starting for single-phase supply, and series-wound 2-pole for d.c. Speed regulators can be provided. The motors are equally suitable for vertical or horizontal operation and are totally enclosed and fitted with ball bearings. The fans are normally supplied with round c.i. frames with stamped mild-steel arms, but square frames are also obtainable on special request. The fans are finished in polished black enamel with the blades painted bright red. Both the d.c. and a.c. models are supplied with 10-, 12-, and 16-in. blades, for speeds of 1,200, 1,160, and 1,140 r.p.m.



"A S" Exhaust Fan

A Self-priming Pump

The accompanying illustrations show temporary staging erected by Messrs. GILBERT GILKES & GORDON, LTD., Kendal, for testing the centrifugal-type self-priming pump which they have recently introduced, and the pump itself. The numbered staff shown prominently in the foreground measures heights above ground level. The small boy has his hand on the suction pipe which rises vertically from the suction tank and then bends over through 180 deg. to enter the pump vertically. The top of this bend is 31 ft. 4 in. above the water in the tank, and the pump is delivering the water through a throttling valve to an open funnel. Exhaustive tests were carried out to demonstrate the priming capabilities of the pump. With the suction pipe empty (there was no foot valve or non-return valve in it) the pump body was filled with about one quart of water and the motor started up. In 2¼ minutes the pump exhausted the suction pipe, drew water over the top of the bend and started pumping. The motor was then suddenly stopped so that the water rushed back down the suction pipe, drawing a large volume of air through the pump. Sufficient water was, however, left in the pump body and in a slight enlargement formed in the suction pipe to enable the pump when it was again started to prime itself exactly as when it was first started up, without adding any more water.



Pump-testing Installation

G. G. & G. Centrifugal Self-priming Pump

This experiment was repeated many times without a single failure.

The feature of self-priming is secured by the centrifugal action of the water, rapidly rotated in the pump during the priming period, and not by any positive action. There are no rolling, reciprocating, eccentric or sliding parts in the pump, the only moving part within the pump being the bronze runner securely shrunk on to its shaft. The runner has an appreciable clearance and does not touch the gunmetal lining of the pump, so that with clean water no wear takes place. The apparatus is of British manufacture throughout, and is supplied as a self-contained, electrically-driven unit in various sizes for performances up to 7.7 gal. per min. against a 120-ft. head.

Built-in Cooking Equipment

To counteract the limited dimensions of the modern house and flat the BRITISH ELECTRIC TRANSFORMER CO., LTD., Wellington House, Strand, W.C.2, has produced an electric oven for building into the wall of the kitchen, so as to occupy no floor space and dispense with the discomfort of stooping. Being flush with the wall, the oven presents a clear surface and obviates dust traps. Cupboards can be fitted under and/or above the oven. The oven interior dimensions are the same as those of the makers' standard "Combination" cooker No. 720, the withdrawable box interior, shelves, top and bottom heating elements, switches and fuses being identical in both cases. The carcase of the oven is made of fine cellular blocks built up into box form rendered on the outside with cement and covered inside with asbestos sheet. The heating elements are fitted in the top and bottom of this carcase, the cooking space being a sheet-steel box protected by a primary coat of vitreous enamel. By withdrawing the steel box interior the elements are easily accessible. The main front and control panel with its surround are all of cast-iron. The carcase, front, control panel and surround are supplied, assembled, and wired in a stout wood frame ready for insertion in another wood frame provided by the builders, as shown in a drawing supplied with the oven so that the fitting on site is very simple. The oven is capable of attaining cooking temperature in 20 to 25 minutes, and fifteen variations of heat are available by means of the two 3-heat switches provided. The oven dimensions are 14 in. by 14 in. by 12 in., and the loading is 1,800 W. To complete the cooking installation there is available a "Tricity" hob fitted with the usual plates, &c., which can be fixed to the wall on brackets or fitted into an alcove. The makers also supply a cool chamber for building in the wall.

"Tricity" Built-in Oven

Electric Lawn Mower

In the "Ray" electric lawnmower lately introduced by the REAY LAWNMOWER CO., Oakwellgate, Gateshead-on-Tyne, the cutting cylinder is driven by an electric motor housed in the land roller of the machine, the supply of current being obtained through a cable connected to any convenient power plug. The housing of the electric driving motor in the roller gives a particularly "clean" appearance to the machine and allows practically all the weight to be concentrated on the roller. This makes the machine easy to handle and at the same time ensures a good rolling action. The mower will deal satisfactorily with all thicknesses of grass, giving a very clean and fine finish. Both the roller and the cutting cylinder are fitted with substantial ball bearings which, with the power cutting, result in very easy working. The motor loading is about 250 W.

The "Ray" Self-contained Electric Lawn Mower

The Shannon Scheme Mystery. By R. N. Tweedy

Is it Death or Re-birth?

DIDN'T I tell you so? The Shannon hydro-electric scheme is a failure! . . . that is the sort of thing that has been said by thousands in Great Britain during the week in which these notes were being written, and there was considerable excuse for the average skimmer of the daily newspaper forming such a summary and unconditional conclusion.

As one who was present during the two days' debate on the second reading of the Irish Free State five-section Bill introduced by Mr. McGilligan, Minister for Industry and Commerce, I may be able to assist readers to a sounder judgment.

The Bill is an amendment of the principal Act of 1927, in two respects. First, it seeks to provide two million pounds for the Electricity Supply Board, over and above the two and a half million pounds granted to the Board by the 1927 Act. Secondly, it seeks to provide a payment of £2,000 to Dr. MacLaughlin, late managing director of the Board, by way of compensation for loss of office, or, as some put it, salary in lieu of notice. The second purpose of the Bill need not delay us longer than to suggest that one year's salary is a niggardly amount to vote to the originator of the most important public work yet undertaken by the Irish Free State, and to the man who for nearly four years has spared no effort to create, inspire, and administer a business which has grown at a rate which would have scared the wits out of most business men.

New Government Bill

There is a highly important difference between the 1927 Act and the 1931 Bill with regard to the way in which the money is to be made available for the Board. By the 1927 Act the Minister for Finance *must* advance without question the sums demanded by the Board, within the maximum of £400,000 in any half year (or, by the amending Act of 1930, larger amounts if the Minister thinks fit) until the two and a-half millions granted by the Dail has been exhausted; but by the Bill which is now entering the Committee Stage, the Finance Minister *may* advance to the Board any such sums, within the limitations imposed, *as the Minister for Industry and Commerce shall certify to be reasonably and properly required by the Board.*

What caused the Free State Government to bring in this Bill? When a full and true answer can be given to that question I feel that a very interesting and a dramatic story will be forthcoming. At present, even after hours of debating, we know the story in part only, and that part is clouded and obscure. No question concerning the five or six millions for the constructional works (that is to say, the original contract) is involved. The design, construction, efficiency, sufficiency, and so on of the Shannon scheme as such are not questioned. The works are there: they have passed into history, and are accepted almost as if they were the Pyramids or Popocatapetl. It is a much more poignant and devastating affair, because it involves the reputations of men who have been highly honoured by the State, and it involves, moreover, the future of this public utility, and perhaps that of others.

The Board's Obligations

The Board created by the 1927 Act was thought to be as independent of party politics and of permanent officialdom as it was possible to make it. It was launched with a blessing and a dowry which was intended to keep it going until the "appointed day" in 1932 when it was expected to be earning its own living, and putting by something for contingencies.

Almost its only obligation to the Houses of Parliament (together with the representative of His Majesty the King called the Oireachthas) was to furnish each year to the Minister for Industry and Commerce "at such date and in such form as the Minister may prescribe" a report and full accounts of the year's working. The only hold the Government has on the Board, which is appointed by the Executive Council (*i.e.*, the Cabinet), is to remove all, or some, of its members whenever such action becomes necessary in the interests of the effective and economical performance of the functions of the Board; whenever such action is taken, both Houses have to be informed of the reasons.

Mr. McGilligan was by turns reticent and frank with the Dail, but there is little doubt that he has not told all he knows, be it for or against him, and there is no doubt at all that we have not heard from him, or from anyone else, the other side of the case. It is a case affecting the late chairman, the late managing director, and the remainder of the Board; to say nothing of its very important repercussions upon the general public. We know now that the invitation to commit *hari-kiri* is the ministerial alternative to being *bumped off* by the Executive Council with all the unpleasant possibilities at the inevitable inquest.

Board Members

Mr. J. J. Murphy, who gave up the position of town clerk of the City of Dublin at the insistent request of the President himself—so it is said—was the first chairman; a man eminently suited to supervise the finances of the new Board. At the third of a series of interviews with the Minister, Mr. Murphy bowed to fate. He resigned from the chair and was reappointed, after a brief interval, as a full-time member for five years. Within a few months of that tragic end and astonishing resurrection comes grim fate again, but this time snips the cords of two actors in the drama, of Mr. Murphy, the twice born, and of Dr. MacLaughlin.

The second chairman, still unscathed, was taken from the highest ranks of the Inland Revenue Department and is known, to his credit, as the "perfect" civil servant. Two less important civil servants were appointed to the Board for some period, which ended in 1929. In the early days of the Board a liason officer was appointed by the Minister to establish the connection between himself and the Board which he had expressly foregone when framing the 1927 Act. He wanted, he said in effect, to wash his hands of the whole business; to shift the responsibility entirely off his shoulders; to do anything and everything to make the Board a free entity solely responsible to the people, and acting entirely upon its own initiative and judgment.

Mr. McGilligan is sincere when he says that the Shannon scheme and the national electricity supply are dearer to him than anything else that is neither human nor divine. Everything he has done since the Board was set up has been done out of an intense desire to serve the public honestly and faithfully; and it is true that, as things have worked out, or as they have been arranged, there is no evidence that anything done by Mr. McGilligan has reacted differently from his intentions; that is to say, prejudicially to the interests of the public. He and the two resigned members of the Board parted company over the interpretation of the main financial section of the Act, although he did not deny, when given the opportunity to do so, that counsel's opinion favoured the Board; and from that he seems to have gone on to make progress, certainly ordered progress, absolutely impossible.

The liaison officer, whose job reminds one of the unpleasant system said to be adopted in certain French schools for the maintenance of discipline, became a full-time member of the Board, and in due course Dr. MacLaughlin was pushed over the edge of the nest. The Electricity Supply Board now has no electrical engineer amongst its five members. Three of them are "business men," who have been explicitly absolved by the Minister from blame in the present muddle, because they were not expected to do much more than is done by "guinea-pig" directors; the chairman is a civil servant in grain, and Mr. Fay, the only other member now that Mr. Murphy and Dr. MacLaughlin have gone, was secretary to the Shannon Development Board.

Cause of Trouble

Now, perhaps, you perceive the conclusion at which I am arriving without touching at all upon the issues which obscured the view in the debate. Let me say quite plainly that the Civil Service of the Free State has no use for the Electricity Supply Board so long as it possesses the Charter given it by the 1927 Act. The permanent officials will not rest until they have engorged this great conception.

They may be right, but that is another day's work. All I want to do is to express my own view, which is shared, I know, by thousands of engineers everywhere, that there is an inherent and a fundamental incompatibility of outlook between the executive or the administrative engineer and the clerk, whatever his grade or title.

If the new Bill should pass as it stands, the Board will be degraded at a stroke from its position of responsible independence to a position in which it cannot buy a transformer, or erect a span of line, or carry out a single function of its existence without satisfying the Minister (and we all know what that phrase means) that the things "are reasonably and properly required." The Minister says he will be glad to wash his hands a second time of the business of the Board directly he clears up the present mess, but is he sure the permanent officials will let him?

Strange as it may seem to those who take their information about the Free State's electricity supply from a well-known Sunday paper, what is wrong with the Board is that one fairy godmother was absent at its birth. It should have been endowed with full powers to replenish its coffers in its own way and at its own discretion. It should have, in fact, the facilities in this respect granted to the English Board.

Minister's Charges

It can write nothing useful about the charges brought by the Minister against the two members of the Board who were forced to resign, because those gentlemen have not yet been given even the proverbial dog's chance.

All we have been told is that the Board has outrun the financial provisions of the Act by a sum approximating to three-quarters of a million, and that the accounts for the year ended March 31st, 1930, are not yet ready for audit, and cannot be made available to the Dail until October at the earliest. That there is a rational, if not an acceptable, answer to these charges I am confident, and I shall be grievously disappointed if a great deal more of the truth, if not the whole truth, is not elicited during the Committee and other stages of the Bill.

Anybody who has heard a Minister of State defending his permanent officials, even at the risk of his political life, would have been amazed at the bitterly condemnatory attitude adopted by Mr. McGilligan towards the late members of the Board. All that will end when the Board has been robbed of its vital force by transformation into a Department; the bag of vipers will coo like any dove.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

United States Electrical Exports

During April, exports of electrical equipment from the United States had a value of $9,880,701, as compared with $11,453,970 in April, 1930. The total for the first four months of the year amounted to $33,354,692, against $48,628,763. The principal declines during April were shown against the following items: D.c. generators, from $81,268 to $33,408; a.c. generators, from $170,967 to $5,634; batteries, from $696,888 to $497,396; transformers, from $497,647 to $171,465; switchboard panels, from $176,309 to $76,775; stationary motors, over 1 h.p., from $363,428 to $200,803; telephone apparatus, from $464,150 to $243,190; and insulated copper wire and cable, from $394,662 to $277,884. There were substantial increases in the cases of radio apparatus—from $1,428,265 to $1,713,830, and steam turbo-generator sets—from $71,165 to $748,699. Canada, the United States' principal customer, took equipment to the value of $2,239,728, Argentina being second in the list with $1,211,960. Other important markets were the United Kingdom ($928,313), Belgium ($492,052) and Mexico ($447,520).

Imports of electrical equipment into the United States, at $214,472, again showed a small increase; the principal item was vacuum cleaners from Sweden.

Henley's Engineering Department

An interesting note regarding the Engineering Department of W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., appears in the summer number of the *Henley Telegraph*. It commenced as the "Box Department" in 1906 as a seller of other manufacturers' products, but in 1910 a shop for the manufacture of cable joint boxes was erected at the company's Gravesend works. This had a floor area of 10,200 sq. ft., but since then this side of the company's business (junction and dividing boxes, feeder pillars, cut-outs, wiring systems, &c.) has grown very considerably, and the Engineering Department at Gravesend now comprises a group of buildings with a floor area of 77,690 sq. ft.

Spanish Duties on Aluminium Cables

The *Board of Trade Journal* states that the increased duties imposed by the Spanish Government earlier in the year upon aluminium wire, without textile covering, and aluminium cables, with or without parts of other metals, do not affect United Kingdom goods at present.

Dutch-German Neon Tube Co-operation

The formation is announced of the Osram-Philips Neon, A.G., in Berlin, with a share capital of 1,000,000 marks. The company has been jointly constituted by the Eindhoven firm of Philips Glowlamp Works and the German Osram company to take over the neon tube business of the founders which was amalgamated a few months ago.

Czecho-Slovakian Electrical Imports

The value of electrical machinery and apparatus imports into Czecho-Slovakia during May was 18,399,000 cr. (£112,000), bringing up the total for the first five months of the year to 110,690,000 cr. (£675,000).

Prince George Visits Porcelain Works

A visit was recently paid by H.R.H. Prince George to the electrical porcelain factory of Messrs. Taylor, Tunnicliff and Co., Ltd., at Stone. The Prince inspected departments where insulators for use on the grid system were being made, and he showed particular interest in the elaborate methods employed in the testing of insulators. He was accompanied on his tour of the works by Col. W. J. Kent, chairman of the company.

Electricity in the Home

A useful little booklet has just been issued by the Charing Cross Electricity Supply Co., Ltd., for the assistance of its consumers. Attention is drawn to some of the services which electricity can be made to perform with details of the cost, and hints are given on meter reading, as well as particulars of the correct lamps to use for various purposes. A chapter on the prevention of accidents is also included.

Electrical Hire-purchase

While the subject of hire-purchase finance is being discussed in our Correspondence columns, it is appropriate to mention a scheme instituted by ELECTRIC LAMP FACTORS, LTD., 41, Rathbone Place, W.1. This company has sent us a pamphlet in which it sets out its terms for the spreading of payments for electrical goods and apparatus over from twelve to twenty-four months. It is claimed that the scheme covers everything electrical with the exception of lamps and valves.

German Foreign Electrical Trade.

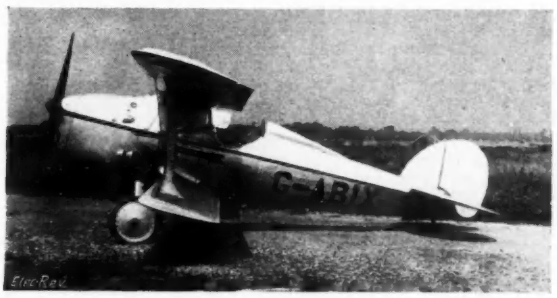
Recent official returns show that the imports of electrical machinery and apparatus into Germany during the four months ended with April last attained a value of £638,750, as compared with £852,850 in the corresponding period of 1930. There was also a decline in the exports of similar material from Germany—from £9,612,750 to £8,092,050.

Palestine Import Concession Extended.

The ordinance providing for the duty-free admission of electric light and power machinery into Palestine has now been extended to include parts of such machinery, for assembly or replacement.

A "Belling" Aeroplane

The aeroplane seen in the accompanying picture has been entered in the King's Cup Race, which takes place next week, by Mr. C. R. Belling, the principal of the well-known fire and cooker firm. He is not piloting the machine himself, but



Mr. C. R. Belling's Aeroplane

later he intends to use the machine for getting about the country on business—particularly, Mr. Belling informs us, to towns which are hiring out Belling cookers.

Italian Electrical Imports and Exports.

The imports of electrical machinery, apparatus, and supplies into Italy during the three months ended with March last attained a value of only £683,635, as compared with £877,215 in the first quarter of 1930. On the other hand, the exports of similar material from Italy advanced from £221,070 to £222,670.

Polish Electrical Imports

During April last the value of imports of conductors, apparatus, and other electrotechnical materials into Poland was 4,622,000 zloty (£106,500).

New French Companies

Among the companies recently formed in France are the Société des Ateliers de Constructions d'Argent (Constructions Mécaniques et Electriques), Brevets Bedie, Paris (92, Rue de Richelieu); La Société des Fabriques Réunies de Lampes Electriques, Ivry, Paris (52, Rue Franklin), capital £160,000; La Société des Transformateurs de Mesure E. Walter, Gentilly Seine (64, Avenue du Docteur Durand), £16,000; and La Compagnie Générale d'Electricité des Iles d'Or, Paris (15, bis Rue Cimarosa).

The Polish Lamp Business

It is stated that after protracted negotiations an agreement has been reached between the German Osram company and the two other large lamp concerns which are active in Poland—the Tungsram Company, which operates with Hungarian capital, and the Dutch Philips Company. Under the agreement, the sales offices of the three companies have been amalgamated and a system of sales regulation has been introduced.

Gambian Tariff Modifications

The Customs tariff of Gambia has not hitherto specified duties on electrical goods and apparatus, and telegraph and telephone equipment. It is now proposed to place duties of 10 per cent. *ad valorem* upon these classes.

Recent Contracts

Messrs. MIRRLEES, BICKERTON & DAY, LTD., have sent us a list of home and overseas orders for their Diesel engines which they have recently received. Among them are the following: The Stone & Webster Engineering Corporation, Boston, U.S.A., has ordered a three-cylinder 165-b.h.p. "Mirrlees-Diesel" engine coupled to a Crompton-Parkinson generator, for installation at Port Ontario, Jamaica; the Panama Corporation has placed an order for three six-cylinder, 450-b.h.p. engines, coupled to G.E.C. alternators; and the West Sussex County Mental Hospital, Chichester, which already has two "Mirrlees-Diesel" engines in operation, has ordered a 200-b.h.p. engine coupled to an E.C.C. dynamo.

For Sale

Messrs. Leopold Farmer & Sons will sell by auction on July 30th at 115, Carlton Vale, Kilburn, plant and machinery of the Full Light Safety Lamp Co., Ltd.

Salford Electricity Department has a number of second-hand d.c. motors for disposal.

Offers are invited by Preston Electricity Department for the purchase and removal of a 1,500-kW rotary convertor.

(See our advertisement pages to-day.)

Social Events

The Automatic Telephone Manufacturing Co.'s sports and social organisation recently held its annual sports meeting at Almonds Green, West Derby, Liverpool. The programme included 52 events, for which there were nearly 500 entrants The main trophy was the George K. Gann silver cup for presentation to the department gaining the highest aggregate number of points during the day. This was won by the Cost Department. The Liverpool Subscription Military Band provided music throughout the day, and at the close Mr. and Mrs. J. Nixon, assisted by Mr. A. F. Bennett, presented the prizes

The seventh annual sports meeting of Standard Telephones and Cables, Ltd., was held on Saturday last. There was a long and varied programme in which employés from the Hendon, Woolwich and New Southgate factories competed. At the conclusion of the events the prizes and challenge cups were distributed by Mrs. E. S. Byng. A pleasant day was concluded by dancing on the green, the music being reproduced and distributed by means of the company's band repeater system, while for those who did not care for dancing there were a number of side shows.

The twelfth annual outing of the staff of Messrs. Aish & Co., Bournemouth, took place on July 11th, when some 80 of their staff journeyed to London to visit places of interest. The evening was spent individually, visiting theatres, &c.

Redfern's Rubber Works, Ltd., of Hyde, entertained their employés, numbering 520, to a trip to Blackpool on Saturday last. The party was met at Blackpool by Mr. W. E. Redfern, the chairman.

The Timber Market

Our Timber Trade Correspondent reports that imports of European building and joinery woods have been small compared with the first half of recent years, but shipments should be larger from now onwards. Stocks generally are moderate. The hardwood market shows very dull trading in mahogany, teak, cedar and other logs, but fresh shipments are being kept down to the poor demand, so that when a spurt in trade does take place prices are likely to advance. Choice British and other Empire sawn timbers can be obtained at satisfactory rates, all things considered. The American varieties are in large stock in the country, values being weak. Good supplies of plywood have recently come forward to fill gaps in stocks, and trade in this material is showing a slight improvement.

Book Notices

"The King's Engineer, No. 10, June, 1931." Price 2s.—The annual journal of the Engineering Society and the Engineering Branch of the Old Students' Association of King's College, London. A supplement with this issue is "The Contribution of King's College to the Advancement of Engineering during the Century 1829-1929," by Prof. Ernest Wilson, M.I.E.E. Price of supplement separately, 3d.

Two publications of the Siemens & Halske A.-G. and of the Siemens-Schuckert A.-G.:—"Von der Werkstatt zur Werkstadt" ("From Workshop to Works Town"), pp. 58, with one portrait and 47 illustrations, in paper cover, Rm. 7; and "Der Siemenskonzern im Zilde" ("Trough the Siemens Works with a Camera"), pp. 200, with one portrait, 148 illustrations, and eight coloured plates, in paper cover, Rm. 7.50. Berlin: VDI-Verlag.

"Mass Production: the Revolution which Changes Everything." By Sir Eric Geddes (21 pp.; 4 diagrams). London: The Pelican Press. Price 6d.—In this booklet—which reproduces a recent address by Sir Eric Geddes—it is shown how mass production reduces costs and prices. The author claims that British manufacturers cannot reap the full benefit of the system unless their home market is protected against the dumping of foreign mass-produced goods.

"Hydro-electric Development in the British Empire," by J. E. Robbins. Pp. xix+143; plates. Toronto: The Macmillan Company of Canada, Ltd., St. Martin's House. Price $1.25.

This week, *Punch* celebrates its ninetieth anniversary by a special issue. This includes a 32-page supplement reviewing the events of the past twenty years (quoting copiously from "Charivaria") in a readable manner. The issue is an excellent shillingsworth.

Prices of Materials.

Messrs. F. Smith & Co. report, July 14th: Copper (electrolytic bars, £39, £10 12s. 6d. dec.; ditto sheets, £49, £10 12s. 6d. dec.; ditto wire rods, 6⅝d., 9/16d. dec.; silicium bronze wire, 9d., ½d. dec.

Messrs. James & Shakespeare report, July 14th: Copper bars (best selected), sheet and rod, £64, £6 dec.; English pig lead, £14. 15s. dec.

Messrs. Edward Till & Co. report, July 14th: India-rubber, Para fine, 4½d., ½d. inc.

British Manufacturers and Australia.

In the course of the report of the British Council of the Australian Association of British Manufacturers, presented at the annual meeting on Monday last, it was stated that it had been possible recently to secure a certain measure of co-operation between representatives of the Association and of the Victorian Chamber of Manufactures, and joint action had been taken in connection with certain tariff matters with advantage to British manufacturers. It was hoped that the movement would extend to other States and ultimately become a Federal matter. The Council emphasised its conviction that the maintenance of the Association in Australia was of the utmost importance to British manufacturers. "The present difficult situation should be regarded as an incentive to greater effort, pending the return to normal conditions. It must be borne in mind that the adverse conditions in Australia under which British manufacturers are at present labouring are also shared by their foreign competitors together with (in practically all cases) a higher rate of duty; yet there is no diminution in the efforts of the latter to maintain and extend their hold upon the market. In fact, present conditions of trading give them opportunities for making valuable concessions to their customers of which the utmost advantage is being taken."

New Catalogues and Lists

The WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, London, N.1.—A number of publications relating to "Westinghouse" metal rectifiers and their various applications.

FEED WATER SPECIALISTS CO., St. Paul's Square, Liverpool.—Technical publication No. 35, containing extracts of an article by Mr. J. McNaught on the colloidal method of conditioning water. Also a pocket diary for July and August.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—A folder entitled "British Industry at Home and Abroad," giving a brief history of the company with particulars of some of its notable achievements.

SUPERLAMP, LTD., 92/94, Paul Street, Great Eastern Street, London, E.C.2.—A 144-page catalogue of cables, wires, switches, lampholders, &c., motors, lamps, meters, lighting fittings, domestic appliances and general electrical accessories.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.—Leaflets Nos. 400, 1010 and 6731, dealing with various types of "Igranic" magnetically-operated swiches; also publication No. 6717 describing the company's push-button control gear and automatic switchgear. Fully illustrated.

MACREADY'S METAL CO., LTD., 7, Baron Street, N.1.—Price lists of mild steel, &c., and an illustrated leaflet dealing with seamless steel shop pans.

HIGGS MOTORS, Witton, Birmingham.—An illustrated pamphlet, describing in detail the construction of a new range ("Type W") of d.c. motors. Full dimensions of each size are given.

HOPKINSONS, LTD., Huddersfield.—List No. 3135; illustrating and describing the company's patent parallel-slide valves and control accessories.

ELECTRIC CONSTRUCTION CO., LTD., Bushbury Engineering Works, Wolverhampton.—An illustrated brochure describing the "Lokaveay" induction motor.

HANSON ELECTRICAL SUPPLIES, LTD., 92a, Baker Street, London, W.1.—A net trade price list of electrical accessories.

ECONOMIC ELECTRIC, LTD., 10, Fitzroy Square, London, W.1.—A leaflet giving particulars of "Premier" domestic telephones.

L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, Kingsway, London, W.C.2.—The July issue of the "Link," with details of a scheme for supplying copies of this publication overprinted with the retailer's name and address.

MARCONIPHONE CO., LTD., Radio House, 210-212, Tottenham Court Road, W.—Two window bills issued in connection with the company's "wet weather sales campaign." These illustrate parties under canvas, making light of wet weather with the aid of Marconiphone portable radio.

The MAGNETO SERVICE CO., High Street Corner, Halifax.—Three illustrated pamphlets, dealing with the firm's magneto, ignition coil and armature testing equipment.

The Macmillan Committee's Report.

The Committee on Industry and Finance, appointed under the chairmanship of Lord Macmillan in November, 1929, issued its report this week. This puts forward recommendations for easing the existing monetary stringency, expanding credit and stabilising prices at a higher level. A minority report signed by Mr. J. M. Keynes and five other members recommends large-scale planning by the State, including the carrying-out, among other schemes, of the electrification of main-line railways on the lines recommended by the Weir Committee.

Trade Announcements

MR. H. SLOOG has removed from 45, Great Marlborough Street to 37-38, Margaret Street, W.1.

Messrs. SAMUEL HODGE & SONS, LTD., 130-132, Leadenhall Street, E.C.3, have taken over the business connections of the Howden-Buell Combustion Co., Ltd., with all rights and interests in the Howden-Buell system of pulverised-coal firing and other engineering specialities.

The annual outing of the London staff of the REVO ELECTRIC CO., LTD., is to be held to-morrow (Saturday), when the London offices will be closed.

Messrs. BARKER, YOUNG & Co., LTD., 47, Victoria Street, S.W.1, announce that in future they will be solely responsible for the marketing in Great Britain and the Irish Free State of the "Unity," "Morganite," and "Electrorad" heating systems.

Messrs. EDWARDS & QUINTON, electrical and radio engineers, have opened new showrooms at 3, Station Parade, Erith.

Messrs. DAVID BROWN & SONS (HUDDERSFIELD), LTD., announce that their Park Works, Huddersfield, will be closed for the annual summer holidays from Friday evening, July 17th, until Monday morning, July 27th.

The DIAMOND FIBRE CO., LTD., has appointed Messrs. MacEchern & Co., Ltd., 79, Knightrider Street, E.C.4, as the sole distributors of its products.

Conditions in Central Europe

Under the auspices of the Industrial Welfare Society, a party of British industrialists recently made a tour in Germany and other Central European countries, in the course of which they studied the conditions in, and the management of, a number of factories of various kinds. Mr. Robert R. Hyde, the director of the Society, was the leader of the party, and at a luncheon arranged by the Society last week he gave an address in which he brought together a number of things observed during the tour in a very telling manner. Sir Harold Morris, K.C., was the chairman, and the company included Sir Basil Clarke, Sir Edward Iliffe, C.B.E., and Mr. C. Le Maistre (director of the B.E.S.A.). Mr. Hyde said at the outset of his address that the party was not concerned with "blue book" matter, but by inquiry in all kinds of directions were able to gain an insight into the conditions obtaining in the countries visited. He said that Germany was no doubt in a serious situation, but there was a determination among the people to pull the nation through. In Czecho-Slovakia, too, there was a strong feeling of national union which we would do well to copy in this country, at the same time realising the interdependence of modern states.

An Insulating Material Exhibit

An interesting exhibit of "Ioco" insulating materials is now being shown by the IOCO RUBBER & WATERPROOFING CO., LTD., in the Vickers House Showroom, Broadway, Westminster, S.W.1. In addition to samples of "Formapex Miocarta" insulating boards and tubes and "Linapex" insulating fabrics, the company is displaying a number of exhibits demonstrating the use of "Ioco" products in the manufacture of cables, transformers, magnetos and automatic telephone apparatus.

South African Duty Increased

The *Board of Trade Journal* reports that the South African duty on radio apparatus and accessories, except when imported for merchant ships or by licensed broadcasting concerns, and not including batteries, is to be raised from 3 to 20 per cent. *ad valorem*.

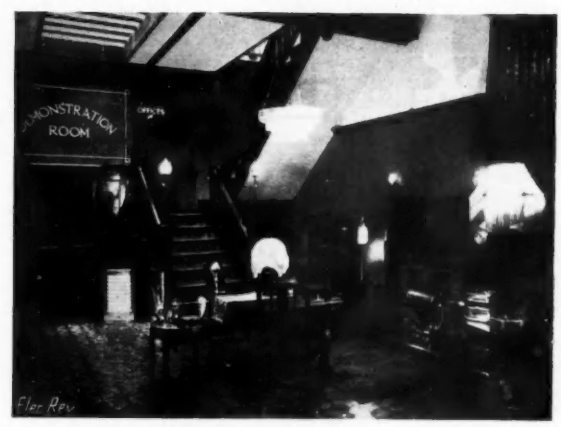
A Demonstration All-electric House

The CAMBRIDGE ELECTRIC SUPPLY CO., LTD., since it has been under the control of Edmundsons' Electricity Corporation, Ltd., has done much to popularise the use of electricity. In addition to reducing the electricity charges, a two-part tariff is now being introduced, and it was to a great extent with the object of introducing this tariff that an all-electric house was organised. This house, which was open for inspection during the week ended Saturday last, included two bedrooms, a bathroom, lounge, dining room, kitchen and scullery, all of which are electrically equipped, while in the garden is a greenhouse fitted with "Heatrae" tubular heating with thermostatic control. The electrical appliances installed include washing and ironing apparatus supplied by L. G. Hawkins & Co., Ltd., cookers supplied by Belling & Co., vacuum cleaners by Hoover, Ltd., and refrigerators by Frigidaire, Ltd., all of whom had representatives in attendance giving continuous demonstrations, while a representative of Electric Fires, Ltd., on certain days, gave short talks to builders, architects, and others on water heating by electricity. An average of over 300 visitors per day inspected the house, in addition to girls from local schools, and a number of orders have been received for wiring installations extensions and various appliances, including several cookers. The E.D.A. assisted by providing literature, blocks, &c., for advertisement purposes in the local Press, and posters. The dining room and scullery are shown in the accompanying illustrations.

Views of the Cambridge Demonstration House

New Municipal Showrooms

The continued activity of the Stockton-on-Tees Electricity Department in the domestic field is demonstrated by the opening recently in Bishopton Lane of extensive new premises as showrooms and offices. Much care has been taken in the lay-out and decoration of the premises, and the results are both business-like and effective. In a large general showroom appliances are displayed in an attractive manner. Leading from this room is a suite of model rooms—a bedroom, bathroom, and lounge. In a corner of the lounge (shown above) is a staircase leading to the offices on the first floor, while access is gained through swing doors to a well-equipped demonstration room. Behind this is ample store accommodation with a back entrance on to Laing Street. On the first floor, besides offices, are the meter testing room and the cooker repair department, while on the third floor are additional offices and a stationery store. Considerable progress is being made by the department in the hiring of apparatus, and at the end of May there were on hire 261 cookers, 37 wash boilers, and 44 water-heaters. Just over a thousand assisted wiring installations have also been connected to the mains, and a hire-purchase scheme is now in course of preparation. The borough electrical engineer is Mr. S. G. Marston.



The Stockton Showrooms

Melbourne Radio Exhibition

The Department of Overseas Trade has received from H.M. Trade Commissioner at Melbourne information regarding the Radio Exhibition held at Melbourne in May. The Commissioner states that the total attendance was over 37,000, an increase of about 60 per cent. as compared with the previous year's exhibition. Of the 26 commercial exhibits, 24 were those of wholesalers or retailers of completed sets, the remaining two exhibits being of British made valves.

Bankruptcy Proceedings

W. H. SAYERS, electrical and radio engineer, 14, Rectory Road, Beckenham, Kent.—The receiving order was made on June 12th on a creditor's petition. According to the statement of affairs, there are liabilities amounting to £7,266, and a deficiency of £7,196. The debtor previously failed in June, 1914, and has not yet obtained his discharge. In 1920, he formed the "Unique Wireless Co., Ltd.," of which he acted as director until 1927, when the company went into liquidation. He then commenced business as a radio engineer under the style of "The Unique Wireless" at St. Martin's Lane, W.C.1, until March, 1928, when he sold the business to the Electramonic Co., Ltd., for 200,000 shares of 1s. each and £12,500 in cash. Out of this he voluntarily discharged the liabilities of the old limited company. He acted as managing director until August, 1929, when he was removed by resolution of his co-directors. Later, at a meeting of shareholders, he was re-appointed to the position. He subsequently advanced about £4,000, mainly borrowed, to the company for trading expenses, &c. The Electramonic Co., Ltd., went into voluntary liquidation for the purposes of reconstruction in August, 1930. In that month a new company styled Electramonic (1930), Ltd., was formed, but this was wound up voluntarily in May, 1931.

A. J. HODGES, electrical engineer, 4, Binswood Street, Leamington Spa, Warwickshire.—A receiving order was made recently on the debtor's own petition, and according to the statement of affairs filed there are liabilities of £985, and assets of £393, leaving a deficiency of £592. Debtor attributes his failure to "lack of capital, bad debts, costs on summonses, and competition."

H. C. ROBINSON, electrical engineer, 41, St. Botolph Street, formerly 39, Queen Street, both Colchester.—The first meeting of creditors was held on July 7th at 9, Arcade Street, Ipswich, when a statement of affairs was submitted which disclosed liabilities of £315 and a deficiency of £281. The case was left in the hands of the Official Receiver as trustee.

W. G. LESLIE, trading as "The Carlisle Ignition Co.," St. Paul's Square, Carlisle, electrician.—This debtor failed to appear for his public examination at the Court House, Carlisle, recently, and a warrant was made for his arrest. The debtor's statement of affairs showed a deficiency of over £734. The examination had been twice adjourned for an inspection of the accounts.

F. CLEASBY (Junior), 2, Richmond Terrace, Darwen, Lancs., electrical engineer.—This debtor appeared at the County Court House, Blackburn, recently for his public examination. His statement of affairs disclosed a deficiency of £100. He attributed his position to "shortage of capital and bad trade." The examination was concluded.

J. S. BLACKBURN, Borough Street, Castle Donington, Leicestershire, electrician.—The first meeting of creditors was held on July 10th at the Official Receiver's offices, Nottingham. The statement of affairs showed liabilities of £331 and assets of £72, leaving a deficiency of £259. Debtor attributed his failure to want of capital, general depression in trade, and slump in prices. The case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate.

A. W. BEAN, electrical engineer, Eastgate, Sleaford.—Receiving order made July 2nd, on debtor's own petition. First meeting, July 22nd, at the Official Receiver's office, 10, Bank Street, Lincoln. Public examination, July 23rd, at the Municipal Buildings, Boston.

R. RAMSDEN, wireless and electrical contractor, 29, Gibbet Street, Halifax.—First meeting held on July 14th. Public examination July 17th, at the Court House, Prescott Street, Halifax.

C. H. LAWSON, electrical contractor, 1,079, Chester Road, Stretford, Manchester.—First meeting held on July 14th. Public examination July 23rd, at the Court House, Encombe Place, Salford.

H. TURNER, radio and electrical contractor, 20, Battersea Rise, Clapham Common, S.W.—Last day for receiving proofs for dividend, July 21st. Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C., Official Receiver.

A. K. E. STRATHDEE (Emsco Radio), electrical engineer, 923, Romford Road, Manor Park, E.—First and final dividend of 1s. 6d. in the £, payable any day at Bankruptcy Buildings, Carey Street, W.C.

S. B. WATSON (S. B. Watson & Co.), electrical engineer and contractor, 73, Crouch Street, Colchester.—First and final dividend of 7¾d. in the £, payable July 10th at 9, Arcade Street, Ipswich.

A. W. KINGSTON, wireless manufacturer and engineer, 9, Newman Street, W.—Receiving order made July 7th, on a creditor's petition.

W. M. PRATT and H. V. CLARK (Magson Clark & Co.), electrical engineers, 165, High Street, Hornchurch, and at South Benfleet.—Receiving order made July 17th on debtors' own petition.

F. V. HOWITT (Falksley Co.), electrical engineer, Riste's Place, Barker Gate, Nottingham.—Last day for receiving proofs for dividend, July 25th. Trustee, Mr. L. A. West, 22, Regent Street, Park Row, Nottingham, Official Receiver.

P. R. H. W. BAYNTON (Scunthorpe Service & Charging Depôt), wireless and electrical engineer, 38, Wells Street, Scunthorpe.—First and final dividend of 2s. 3d. in the £, payable July 15th at the Official Receiver's office, St. Mary's Chambers, Great Grimsby.

Company Liquidations

H. STANLEY, LTD., wireless dealers, 58, High Road, Chiswick.—The statutory first meetings of the creditors and shareholders of this company were held on July 9th before Mr. E. T. A. Phillips, Official Receiver. The winding-up order was made on June 8th upon the petition of Midland Auto Components, Birmingham, creditors for £187. The unsecured liabilities are returned at £450, and the failure was attributed to insufficient capital, to the issue of debentures which prevented the company from obtaining credit, and to loss on the trading at a Fulham branch. Mr. E. H. Hawkins was appointed liquidator with a committee of inspection.

ELECTRO BLEACH AND BY-PRODUCTS, LTD.—Winding up voluntarily. Joint liquidators, Mr. J. K. Batty and Mr. D. Drummond, both of Winnington, Northwich.

ELECTRODRIVES, LTD.—Meetings, August 21st, at Curtis Buildings, Park Royal, N.W., to receive an account of the winding up by the liquidator.

ELECTRAMONIC CO. (1930), LTD.—Particulars of claims by July 31st to the liquidator, Mr. K. D. Hutton, 5, John Street, Bedford Row, W.C.

BOROUGHBRIDGE & DISTRICT ELECTRIC SUPPLY CO., LTD.—Meeting, August 10th at the office of Mr. C. E. Winder, liquidator, Boroughbridge, to receive an account of the winding up

Private Arrangements

J. CUNNINGHAM, trading as Cunningham, Beard & Co., electrical engineer and wireless expert, 6, St. Mary Abbot's Terrace, Kensington, London, W.—A meeting of the creditors was held on July 9th at the offices of Messrs. Beecroft, Sons and Nicholson, accountants and valuers, 12, Wood Street, London, E.C. The statement of affairs presented showed liabilities of £3,179, of which £1,239 was due to the trade, and local and sundry creditors amounted to £426. The bank were shown as cash creditors for £513, and the debtor's wife claimed £1,001. The assets totalled £1,195, and after allowing £229 for preferential claims, the net assets were £966, or a deficiency of £2,213. The creditors decided to confirm the deed of assignment already executed in favour of Mr. William Nicholson, as trustee, and a committee of inspection was also appointed.

ELECTRICAL AND RADIO PRODUCTS, LTD.—Meetings of the creditors were held on July 9th at Winchester House, Old Broad Street, London, E.C., for the purpose of considering a scheme of arrangement between the company and its creditors. Mr. S. F. Thomas, of the General Electric Co., Ltd., said that it would be remembered that a meeting of the unsecured creditors was held on May 20th, when a committee was appointed. That committee had come to the conclusion that if liquidation took place there would, in all probability, not be sufficient assets to pay the debenture holders in full. The committee was unanimously of the opinion that the present position of the company was due to difficulties arising out of the original reconstruction of Aeonic Radio, Ltd. Under the scheme of arrangement now proposed, it was suggested that Electrical and Radio Products, Ltd., should go into liquidation, and that a new company should be formed under the style of Electrical and Radio Products (1931), Ltd., with a share capital of £20,924, divided into 436,960 redeemable preference shares of 6d. each and 40,000 ordinary shares of 5s. each. The debenture holders in the present company would receive "B" first debentures in the new company. In addition, Mr. Gottlieb, the holder of the majority of the debentures, would subscribe £3,000 in the form of debenture capital and £4,350 in share capital. The unsecured creditors included some who were originally creditors of Aeonic Radio, Ltd., and had novated their claims. Under the scheme those creditors would receive 3s. 6d. in the £ in cash and a further 1s. 6d. in the £ secured to them by "A" first debentures in the new company. All the other unsecured creditors would receive 5s. in the £, to be secured by the "A" first debentures in the new company. The "A" debentures in the new company would be redeemable over a period of three years, and would carry interest at the rate of 7½ per cent. per annum. Resolutions were passed approving the scheme.

AEONIC RADIO, LTD.—A meeting of the creditors was held on July 8th for the purpose of considering a scheme of arrangement. It was pointed out that the company had gone into liquidation under a scheme of reconstruction, and the whole of the property and assets had been transferred for a certain consideration to a new company. Under the scheme Mr. J. L. Gottlieb was to pay sums totalling £2,700, which was the estimated amount necessary to make up the equivalent of 4s. in the £ on the claims of the unsecured creditors. It was also proposed that on or before July 31st next there should be paid £1,000 to Marconi's Wireless Telegraph Co., Ltd., in full settlement of a pending action. The scheme was approved, and it was stated that application would be made for the petition presented by one of the creditors for the compulsory liquidation of the company to be withdrawn or dismissed.

E. MARX, electrical fittings dealer, 34-36, Oxford Street, London, W.—A meeting of the creditors was held on July 6th at the offices of Messrs. Bryden, Johnson & Co., C.A., 108a, Cannon Street, E.C.4, when an approximate statement of affairs was submitted which disclosed liabilities of £812, of which £792 was due to unsecured creditors, and a claim for rent of £20. The assets consisted of book debts, estimated to produce £90, leaving a deficiency of £722. An offer was made of 1s. 6d. in the £ as and when the book debts were realised, but no definite resolution was passed.

Electricity Supply

Lighting, Domestic, Power

Argentina.—According to the annual report of the Société d'Electricité de Rosario the output from the company's generating plants amounted during 1930 to 81,447,069 kWh, as compared with 76,067,005 kWh in the preceding year. The total capacity of the plants is now 56,800 kW.

Barrow-in-Furness.—LOAN.—The Town Council is to apply for sanction to a loan of £20,000 for unspecified mains and services.

Birmingham.—YEAR'S WORKING.—An increase in revenue from £1,852,581 to £1,899,757 is shown in the accounts of the Corporation Electricity Department (engineer: Mr. F. Forrest) for the year ended March 31st last. Working expenses rose slightly from £1,012,066 to £1,015,338, the gross profit being £884,420, as against £840,515 in the preceding year. To the gross profit was added income from other sources making a total of £889,452 available. From this the following items had to be met: Interest on loans, £396,712 (against £359,843 in 1929-30); loan repayment, £374,163 (£291,422); other items, £2,511 (£15,231). There thus remained a net profit of £116,066 which compares with £175,539 in the previous year. During the year the capital expenditure amounted to £571,313, the principal items being £359,143 for mains and services and £182,917 for machinery and plant; the total spent on the undertaking is now £11,604,934. Sales of electrical energy showed an increase of just over two million kWh, the total being 359,903,854 kWh. The effect of adverse trading conditions prevailing throughout the year was severely felt, particularly during the latter half, and the results would undoubtedly have been less satisfactory but for the expansion on the domestic side. New consumers connected numbered nearly 19,000 and represented an increase of 45,721 kW during the year, making the total connections to the system to date 377,349 kW.

Brighton.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. W. N. C. Clinch) for the twelve months ended March 31st last show a total revenue of £326,067 and a working expenditure of £167,686, leaving a gross profit of £158,380. The corresponding figures for the preceding year were: Total income, £279,853; working expenses, £154,491; gross profit, £125,361. After deducting capital and other charges there was a net profit of £38,670, as against £25,971 in 1929-30. During the year the capital expenditure amounted to £105,874, making a total of £1,965,541 now spent on the undertaking. Electrical energy sold increased from 36,073,797 to 54,853,814 kWh, and the maximum supply demanded from 20,900 to 28,900 kW. The average price obtained per kWh fell from 1.65d. to 1.30d.

Burton-upon-Trent.—YEAR'S WORKING.—We have received from Mr. T. Hall, borough electrical engineer and manager, a copy of his annual report, together with a statement of accounts of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £125,457, as compared with £126,294 in the preceding year, while the working expenditure decreased from £65,419 to £57,840. There was a gross profit of £67,618, as against £60,874, and after providing for capital and other charges there remained a net profit of £6,207, as compared with £1,432 in 1929-30. During the year the capital expenditure amounted to £52,250, making a total of £882,777 now spent on the undertaking. Sales of electricity fell from 28,467,674 to 22,796,181 kWh, and the maximum load from 9,020 to 8,150 kW. The decreases are due mainly to the closing down of a large factory taking over 7¼ million kWh per annum. The abandonment of the tramway system was also responsible for the loss to the Department of approximately £5,000. Energy sold for domestic purposes, however, showed considerable increases, there being an increase of 400,184 kWh in lighting consumption and 305,885 kWh in heating and cooking consumption. The average price obtained per kWh increased from 1.03d. to 1.28d. The number of new consumers connected was 2,716, the total number now being 11,721. Of this number over 5,500 represent assisted-wiring consumers. During the year the districts of Hartshorne, Anslow, and Cauldwell were connected to the distribution system, while a bulk supply to Uttoxeter was commenced in October last.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—Rapid progress is being made on the installation of the first two generators in the Chats Falls hydro-electric plant on the Ottawa river. The two generators, each of 28,000 h.p., are nearly completed; progress on the dam and power house is such that it is expected that electrical energy will be delivered at Toronto on October 1st. The Chats Falls power development ranks as one of the largest hydro-electric power projects in Canada. It is a joint undertaking of the Ontario Hydro-Electric Power Commission and the Ottawa Valley Power Company. The eight units comprised in the initial installation will develop 224,000 h.p., but the addition of an extra waterwheel and generator at either end of the power house provides for an ultimate capacity of ten units generating 280,000 h.p. The transformers are being supplied by the Canadian General Electric Co., and these will step-up the current from the generator voltage of 13,200 to the transmission voltage of 220,000. Power will be transmitted to Toronto to further augment the energy required by the Ontario Hydro-Electric Power Commission, which in addition to its own portion of the power at Chats Falls is purchasing the power generated from the Quebec half of the flow of the Ottawa river.

THE ST. LAWRENCE POWER SCHEME.—The Committee of the House of Commons appointed to investigate the Beauharnois power canal scheme, recently heard the evidence of Mr. Duncan McLachlan, chairman of the Joint Board of Engineers for the St. Lawrence waterway project. He stated that the intake of the canal had been moved 3,000 ft. from its position on the original plan, without the consent of the Government; he regarded this as dangerous to navigation. Other deviations from the plans submitted to the Government were that the first mile of the canal was now 3,300 ft. wide instead of 1,100 ft., and another section which should have been 4,100 ft. had been reduced to 3,400 ft. The reason for widening the canal was to increase the development of power, but it would curtail the navigation period in Montreal Harbour, and involve considerable financial loss to shipping. Mr. McLachlan strongly condemned the changes in the plan as unlikely to meet with the approval of the American engineers on the Joint Board, and said that if the corporation was allowed to divert the whole flow of the river into its canal for power development, the St. Lawrence waterway project would be imperilled.

Chesterfield.—LOAN.—The Town Council has applied for sanction to a loan of £22,500 for wiring work and meters.

Colchester.—ELECTRICAL DEVELOPMENT.—A scheme has been prepared by the Corporation Electricity Committee for the development of the electricity undertaking in eight areas, at a cost of £60,000, with a view to aid from the Unemployment Grants Committee. The Electricity Committee estimates an expenditure of £80,000 during the year on services, mains, meters, &c., and is to apply for sanction to a loan of that amount.

WALTON-ON-THE-NAZE UNDERTAKING.—Sanction has been received to a loan of £10,100 in respect of the proposed acquisition of the Walton-on-the-Naze undertaking.

ASSISTED WIRING.—The Corporation Electricity Committee has obtained sanction to a loan of £14,000 for assisted wiring installations.

Darwen.—YEAR'S WORKING.—For the past year the Corporation Electricity Department made a net profit of £3,263, as compared with £6,959 for the previous year. This is the twelfth successive year in which the Department has been able to show a profit.

Dover.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. R. C. Harpur) for the twelve months ended March 31st last show a total revenue of £50,395 and a working expenditure of £28,513, leaving a gross profit of £21,882. The corresponding figures for the preceding year were: Total income, £49,846; working expenses, £28,955; gross profit, £20,891. To the gross profit was added the balance from the previous account (£2,641) and interest on stock redemption fund (£126), making a total of £24,649 available. After providing for capital and other charges there was a net profit of £6,564. During the year the capital expenditure amounted to £2,136, making a total of £322,397 now spent on the undertaking. Electrical energy sold increased from 3,387,581 to 3,630,112 kWh. The maximum supply demanded was 1,428 kW a.c. and 525 kW d.c. The average price obtained per kWh fell from 3.53d. to 3.33d.

Dumfries.—ELECTRICITY SCHEME.—The County Council has approved an extension of the scheme for the distribution of electricity throughout the county, including all the burghs with the exception of Dumfries. The capital cost has been more than doubled—from £209,695 to £451,512. Under the scheme approved by the Council in February, 6,000 houses or premises were to be supplied. Under the new scheme electricity will be available for practically the whole county, and over 13,000 houses are situated in the area to be served by the undertaking. The maximum aggregate length of distribution lines that may possibly be required for the supply for these houses is 15.3 miles of l.p. and 869 miles of e.h.p. The Committee propose to introduce an assisted-wiring scheme. The Council has received assurances from the Central Electricity Board that a supply from the grid will be available at Gretna, Dumfries and Moniane as soon as the Council is able to distribute and not later than 1933. Meantime the Central Electricity Board is constructing a 33,000-V line from Carlisle to Gretna. From that, electricity in bulk will be available not later than October of this year for distribution in Gretna and for an advance supply in Annan. The headquarters of the undertaking are to be in the neighbourhood of Dumfries. The Electricity Committee has received the sanction of the Council to obtain tenders for an extension of distribution mains from Eastriggs to Annan at a cost of £3,100. Extensions are also contemplated in the Gretna area.

Eastbourne.—HIRE-PURCHASE.—The Corporation Electricity Committee has approved a hire-purchase scheme for cookers and for water heaters. The question of the hire-purchase of cookers now on circuit and any payment to local contractors disposing of water heaters, or other apparatus excluding cookers, has been referred to the borough treasurer and the electrical engineer. Applications for hire-purchase in respect of assisted wiring are to be considered on their merits.

Exmouth.—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council a letter was read from the East Devon

Electricity Company, stating that as soon as the reconstruction works were completed the schedule of charges proposed by the company would be formulated. In the meantime it was proposed to retain the present flat rate charges of 8d. and 2½d. per kWh, and to offer consumers an alternative two-part tariff under which the "unit" charge for all purposes would be 1½d., with a fixed quarterly charge, dependent (*a*) in the case of private residences, &c., upon the regularly occupied floor area, and (*b*) in the case of shop windows, outside lighting, &c., upon the wattage of the lamps in regular use. The letter added that the company's 33,000-V overhead transmission line between Newton Poppleford and Withycombe Raleigh, *via* East Budleigh, had now been put into commission.

Fleetwood.—NEW ROTARY CONVERTORS.—Sanction has been received by the Town Council to the borrowing of £10,000 for the purchase and installation of three rotary convertors, &c., at the electricity works.

Glasgow.—YEAR'S WORKING.—The annual report of the Corporation Electricity Department for the past year shows a net profit of £27,121. The gross revenue amounted to £1,306,574 and the working expenditure to £620,557. Taking into account the serious trade slump which has been experienced during the whole year, the report states that the result of the year's working may be considered very satisfactory. The gross revenue shows a decrease of £172,335, as compared with the previous year's figure. There was a reduction in electricity sold of 13¼ million kWh, equal to over 5 per cent. The reduction in industrial power consumption was 26½ million kWh, against which there were increases of over 4½ million kWh in domestic sales, 6¼ million kWh in business sales, and one million kWh in public lighting. The loss in revenue from power sales was more than made up by the increase in domestic and business consumption, so that the reduction of over £172,000 was entirely due to reductions in charges. The working expenditure shows a decrease of over £2,000. Redemption of loans amounted to £342,395, being a reduction on the previous year of £67,824. In addition, £50,462 was expended out of revenue on capital items. The net capital expenditure amounted to £122,355, being less than the previous year by £19,000. The outstanding capital debt was reduced during the year by £342,395.

MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £4,000.

Hastings.—EXTENSIONS.—The Corporation Electricity Committee has prepared extension schemes costing £34,500 for the relief of unemployment.

Hexham.—STREET LIGHTING.—The Urban District Council has accepted the tender of the Hexham and District Electric Supply Co. for street lighting for a period of twelve months.

Heckmondwike.—OFFER TO PURCHASE DECLINED.—The Urban District Council has declined to entertain a proposal by Electric and Gas Industries, Ltd., to purchase the Council's electricity undertaking.

Ipswich.—YEAR'S WORKING.—An increase from £165,334 to £170,789 in the revenue of the Corporation Electricity Department is recorded in the report for the past year. Working expenses amounted to £87,075, as compared with £86,392 in the preceding year, while the gross profit was £83,713 (£78,943). After providing for loan charges, &c., there was a net profit of £23,977, which compares with £24,626 in 1929-20. Capital expenditure during the year amounted to £73,490, the total now spent on the undertaking being £852,292. Electrical energy sold totalled 21,017,724 kWh, as against 23,291,486 kWh, the decrease being due to the closing down of the Stowmarket Silk Works, which in the previous year received a bulk supply amounting to almost 4,000,000 kWh; the maximum demand fell from 13,400 kW to 11,700 kW. The average price obtained per kWh sold decreased from 1.691d. to 1.646d., a reduction in charges having been made at the beginning of the year under review.

Irish Free State.—THE DRUMM BATTERY.—It is announced that the Drumm battery has passed satisfactorily through some two-thirds of its laboratory tests with regard to its life. A life of five years was calculated originally and the tests have gone to show that this may be a conservative estimate. On the practical side, the experimental coach tests confirm the findings of the laboratory. The work of preparing the new coaches which are to be run by the Drumm battery on the Dublin-Greystones line is well advanced, and it is expected that a train will be run early in August.

Liverpool.—PUBLIC LIGHTING.—The report of the city lighting engineer, Mr. P. J. Robinson, on the public lighting of the city for the year ended March 31st last shows that the total length of roads lighted by electricity increased from 186 to 202 miles, and the number of electric lamps from 10,434 to 11,607. Good progress was made in the elimination of glare and increasing of visibility, and there are now over 10 miles of roadways radiating from the hub of the city fitted with the new type of lantern designed for the purpose. The gross expenditure of the City Lighting Department amounted to £128,868, and a revenue of £12,434 was derived, principally from work performed for and material supplied to other departments and committees, making a net expenditure on public lighting of £116,434. The net expenditure in the preceding year amounted to £111,125.

Oldham.—YEAR'S WORKING.—The annual report on the electricity undertaking, which is subject to audit, shows an estimated surplus on the past year's working of £1,556, as compared with a surplus of £1,071 in the preceding year. Increases are marked in the electrical energy sold for private lighting, public lighting, and under the rateable-value scheme. Power supply shows a decrease of 19½ per cent., and traction a decrease of 5½ per cent., the decrease in the total sales for all purposes being 11½ per cent.

Peterborough.—LOANS SANCTIONED.—The City Council has received sanction to loans of £15,000 for mains and services, £4,144 for sub-stations, £799 for sub-station expenditure up to March 31st, 1930, £5,000 for meters, £1,500 for lighting fittings for hire, £5,000 for domestic apparatus, £1,000 for prospective expenditure on public lighting, and £900 for a new sub-station in St. Paul's Road.

Ripon.—EXTENSIONS.—The Corporation Electricity Committee is to apply for a grant for proposed extensions to Wath, Melmerby, Grewelthorpe, Kirkby and Skelton.

Southport.—ELECTRICAL ILLUMINATIONS.—The Town Council is recommended to apply for sanction to a loan of £6,000 for electrical illuminations on the New Bridge Islands, colonnades, bathing lakes, and floral hall.

South Shields.—BULK SUPPLY.—At a recent meeting of the Corporation Electricity Committee, the chairman reported that he had attended a meeting in Sunderland, convened by Mr. Blackman, electrical engineer to the Sunderland Corporation, to consider the question of setting up a bulk supply committee for North-East England. It is intended that the committee shall deal with all matters appertaining to bulk supplies given by the supply companies in the area. As a result of this meeting it was unanimously decided to form a sub-committee to draw up the constitution of the proposed bulk supply committee. It was decided to be represented on the proposed sub-committee and the chairman and borough electrical engineer were appointed as representatives.

ASSISTED WIRING.—The Corporation Electricity Committee is to apply for sanction to a loan of £5,000 for the assisted wiring scheme.

Stoke-on-Trent.—YEAR'S WORKING.—The accounts of the Electricity Department (engineer: Mr. C. H. Yeaman) for the twelve months ended March 31st last show a total revenue of £217,113 and a working expenditure of £159,138, leaving a gross profit of £57,975. The corresponding figures for the preceding year were: Total income, £221,424; working expenses, £102,617; gross profit, £118,807. The increase in the working expenditure is due to the fact that the electricity undertaking came under the control of the North-West Midlands Joint Electricity Authority in April, 1930, and the expenditure therefore includes the cost of purchasing electricity in bulk from the Authority, which for the year amounted to £109,002. After deducting capital and other charges there was a net profit of £4,751, as against £13,891 in the preceding year. The capital expenditure during the year amounted to £96,978 and included £55,049 spent on mains. The electrical energy sold increased from 38,245,303 to 38,772,850 kWh. The average price obtained per kWh fell from 1.416d. to 1.394d.

Spalding.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £10,000 for electricity purposes.

Sunderland.—LOAN SANCTIONED.—The Town Council has received sanction from the Electricity Commissioners to borrow £5,104 for laying low-pressure and medium-pressure mains.

GRID SCHEME.—The putting into operation of the "grid" scheme so far as Sunderland is concerned is to take effect shortly. It is intended that the Sunderland station shall generate power for part of the Tyneside region south of a Tyne. The Corporation is to be recommended to enter into negotiations with the Central Electricity Board for a temporary bulk supply to the Board for a period of four years.

YEAR'S WORKING.—The sales of the Corporation Electricity Department during the year ended March 31st last totalled 34.3 million kWh, against 37.4 million kWh in the previous year. Of the total, 21.4 millions was used for power, 8 millions for lighting, heating, and domestic purposes, and 3 millions for traction. Industrial depression accounts for the drop in sales. The total income was £192,348, and the balance carried to net revenue account was £86,518, of which £10,000 is contributed to relief of rates and £7,516 allocated to reserve fund. During the year 14 miles of mains were laid, bringing the total route length to 222 miles.

Torquay.—LOANS.—The Corporation is to apply for sanction to loans of £3,000 for switchgear, and £6,000 for the construction of an overhead line from Ashburton to Newton Abbot to complete the ring main.

Weymouth.—ELECTRICITY EXTENSIONS.—The Town Council has received sanction to loans of £23,000 for mains and services, and £2,000 for sub-station plant. A further loan of £3,000 for meters has been applied for.

Worthing.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking for the past year show a total revenue of £81,081, as compared with £75,007 in the previous twelve months. Working expenses totalled £47,598, as against £35,805, and there was a gross profit of £33,482 (£39,201). The balance standing to the credit of the appropriation account at March 31st was £4,761, as compared with £9,030 at the corresponding date last year. The number of consumers increased by 295, making a total of 10,070 now connected. A reduction of charges was made during the year and a two-part tariff was introduced.

Traction

Barrow.—TRAMWAY ABANDONMENT.—The Town Council has decided to replace the tramways by motor-omnibuses as from April 1st next.

Birmingham.—YEAR'S WORKING.—The Corporation Tramway and Omnibus Committee in its annual financial report state that the past year was the most difficult in the history of the undertaking, due to trade depression and adverse weather conditions. During last summer there was an unprecedented succession of wet week-ends, the receipts for many week-ends being down by over £2,000. Despite the fact that during the year additional 'bus services were inaugurated, and that the number of omnibuses in service had been increased by 65, the total gross profit from all services fell short of the previous year's gross profit by £11,000. The fall in income on the tramway service amounted to approximately £82,000, but expenditure was lower by £32,000, so that the net decrease in gross profit was £50,000 compared with the previous year.

Ipswich.—YEAR'S WORKING.—The accounts of the Corporation railless-car undertaking show a total revenue of £70,682 and a working expenditure of £52,957, leaving a gross profit of £17,724. The corresponding figures for the preceding year were: Income, £67,859; working expenses, £49,672; gross profit, £18,187. Loan charges absorbed £13,859 and there was a net profit of £3,951 as compared with £4,461 in 1929-30. Capital expenditure during the year amounted to £8,191, from which was deducted £2,225 from displaced or superseded work; the total spent on the undertaking now stands at £174,005. The number of passengers carried increased from 12,175,012 to 12,717,775 and the car-mileage from 1,260,092 to 1,304,334. The average revenue per car-mile was 13.005d., as compared with 12.924d. in the previous year.

Oldham.—YEAR'S WORKING.—The report of the general manager and engineer of the Corporation tramway undertaking for the year ended March 25th last shows a total income of £176,776, as compared with £192,701 in 1929-30. Working expenses were lower at £142,680 (as against £155,559), and the gross profit was £34,096 (£37,142). After deducting loan and other interest, &c., there was a net surplus of £3,076 (£4,760). The number of passengers carried decreased from 32,938,207 to 28,323,004, and the average total revenue per car mile fell from 18.364d. to 17.519d. There was also a decrease in the number of car-miles run from 2,518,387 to 2,421,678.

Southport.—YEAR'S WORKING.—The accounts of the Corporation tramways undertaking (general manager: Mr. T. J. Kendrew) for the year ended March 31st last show a total revenue of £68,395, as compared with £69,572 in the preceding year. Working expenses amounted to £52,485, against £54,867 leaving a gross profit of £15,910 (£14,705), and after providing for capital and other charges there was a net surplus of £10,425, as compared with £5,764. The number of passengers carried was 12,636,672, a decrease of 67,553, and there was also a decrease in the car-miles run from 1,195,297 to 1,188,038.

Stockton.—PROTECTIVE FARES.—The Northern Area Traffic Commissioners have granted permission to the General Omnibus Co., Ltd., to run a service from Middlesbrough to Newcastle. Protective fares in respect of their tramway undertakings were sought by the Corporations of Newcastle, Gateshead, Stockton, and Middlesbrough and the Commissioners stipulated that the Omnibus Company should charge at least 1d. above the tramway fare in these districts.

TRAMWAY ABANDONMENT.—At a special meeting of the Corporation it was decided to substitute 'buses for tramcars on the Norton-Stockton route at the end of the current year.

Telegraph and Telephone

Australia.—LONG-DISTANCE TELEPHONY.—A direct telephone service between Brisbane and Perth, a distance of 3,400 miles, has been officially inaugurated. The connection is made through the main trunk-line exchanges of Brisbane, Sydney, Melbourne, Adelaide, and Perth. Between Brisbane and Melbourne, 1,300 miles, carrier-wave equipment is employed, and from Melbourne to Perth, 2,100 miles, an ordinary metallic circuit is used.

Colombia.—NEW RADIO STATION.—The Federal Government has signed a contract with All-America Cables, Inc., for the erection of a wireless and radio-telephone station at Medellín. In view of the monopolistic character of the concession, the owners to the electric plant at Zipaquira, a suburb of Bogotá, have found it advantageous to dispose of their holdings to North American purchasers (the Electric Bond and Share Company) who have taken over all concessionary rights at a fair price.—*Reuter's Trade Service* (Bogotá).

India.—NEW RADIO STATION.—Bedi Port, Kathiawar, is to have a new wireless station for communication with ships at sea. The transmitting and receiving equipment is being manufactured at the Marconi Company's works and will operate on the interrupted continuous-wave system with a power of 1½ kilowatts, the receiver covering the exceptional wave range of 15 to 22,000 metres.

Italy.—TELEPHONES INSTALLED FREE.—Some thirteen thousand new subscribers were enrolled in a single month as a result of the telephone company's offer of free installations during the month of May, says a *Reuter* Rome message.

The Telephone Service.—SOUTHAMPTON.—Last weekend an important extension of the automatic telephone system in Southampton was brought into use, transferring about 800 subscribers from the central exchange in Ogle Road to the newly-installed equipment at Portswood. The new Shirley automatic equipment and the Woolston exchange will be brought into use in September.

Radio

Canada.—STATE CONTROL.—The Premier of Quebec is to contest the recent judgment of the Supreme Court of Canada that the control of broadcasting is vested in the Federal Parliament and not in the provincial Legislatures. He announces that he will appeal to the Judicial Committee of the Privy Council. Until the appeal is decided, no action can be taken by the Federal Government with regard to the nationalisation of the service on the English method as recommended by the Federal Commission last year.—*Reuter* (Quebec).

Italy.—TOURISTS' PORTABLE SETS.—For the convenience of foreign visitors, arrangements have been made whereby portable wireless sets may be imported temporarily by depositing the Customs duty (1.68 gold lira (1s. 4d.) per kg., or about 13s. for 22 lb.) at the frontier station or port of entry, which amount will be refunded when leaving the country. Those wishing to avail themselves of this facility should communicate with the Italian State Tourist Department, 16, Waterloo Place, Regent Street, London, S.W.1.

North Regional.—DUAL SERVICE.—The full dual programme service of the north region commenced on July 12th. The transmitter, working on a wave-length of 479.2 metres, radiates a regional programme of items originating locally. The national transmitter (301.5 metres) in general relays the Daventry national programme.

From July 12th to August 2nd the Newcastle transmitter will continue to operate on the national common wavelength of 288.5 metres. On August 2nd, at first on an experimental basis, the Newcastle transmitter will be synchronised with the north regional transmitter at Moorside Edge, near Huddersfield. Equipment is now being installed for both transmitters, and all possible steps are being taken to make the experiment a success.

Public Loud-speakers.—LONDON BY-LAW.—A by-law made by the Borough of Deptford has been allowed by the Home Secretary. The use of loud-speakers or gramophones in shops or business premises in such a manner as to cause annoyance to the occupants of the neighbouring premises or passers-by is now prohibited, the penalty being a fine not exceeding £5 for each offence.

Radio Exchanges.—BLACKBURN.—The Town Council has considered plans submitted by the Suburban Radio Relay Co. for a relay system in the Whalley New Road and Brownhill districts; by Mr. John Walsh, wireless and electrical engineer, for similar systems at Bastwell, Little Harwood, Witton, Mill Hill; by Mr. John Slater for Havelock Street, Bolton Road, Wensley Street, and other thoroughfares; and by Mr. J. F. Riley to serve Granville Road and Revidge. It was recommended that the two last-named be approved subject to the payment of an acknowledgment where wires cross streets and to the whole subject of relaying systems and their control being reviewed by the Corporation in February, 1932. The full committee, however, referred the applications back for further consideration.

BIRMINGHAM.—At least six firms have applied to the City Corporation for permission to erect overhead wires for relaying purposes and their applications are being considered by the Public Works Committee. Amongst them is Radio Relays, Ltd. (a subsidiary of the G.E.C.) which has introduced a similar service in Coventry.

Radio Interference.—CZECHO-SLOVAKIA.—The Electro Technical Society, known as the E.S.C., recently held a meeting in Carlsbad, when important resolutions were passed regarding the combatting of radio interference.

GERMANY.—The campaign against interference is showing good results. The exhibition of special films show the public how to guard against trouble, and prosecutions have been successful.

BELGIUM.—It is announced that the authorities of one Belgian town have made interference with radio reception an indictable offence with a heavy fine or one week's imprisonment as the penalty.

FRANCE.—The authorities in Bihorel are the latest to issue a proclamation warning the townsfolk that it is a punishable offence to use electrical apparatus which causes radio interference.

NORTH AFRICA.—The tramway authorities of the French town of Oran are making a determined fight against interference caused by their system, and are experimenting with a new type of trolley for collecting from overhead wires. The Syndicat des Industries Radio-Electriques at Algiers is undertaking a campaign, and listeners are asked to report the kinds of interference noticed, their intensity, degree of regularity, and the exact time of occurrence. It is hoped, by this means, to trace the exact source of disturbance and to apply remedies.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—ROSARIO.—August 9th. Municipal Council. Refuse destruction plant. (A.X. 11011.)*

Ayr.—County Council. Electric lighting of 54 houses. Schedules from Mr. Wm. Reid, county architect, 14, Wellington Square.

Belgium.—BRUSSELS.—July 22nd. Belgian Telegraph and Telephone Authorities. Supply and laying of a quantity of telephone cable. Particulars (Cahier des Charges Spécial No. 3-561) for 18 francs from Régie des Télégraphes et des Téléphones, Brussels.

August 5th. Supply and laying of telephone cables and accessories at Templeuve, Leuze, Antoing, Charleroi, Meriembourg, Ecaussines, Roeulx, Feluy-Arquennes, Rhode-Saint Genese, Hoeylaert, and Braine-l'Alleud. Particulars (Cahier des Charges Spécial No. 3-569) for 15 fr. from Régie des Télégraphes et des Téléphones, Brussels.

July 29th. Telephone cables and accessories for Tervueren, Haecht, Opwyck, Cortenberg, Landen, Saint-Trond, Bree, Neerpelt, Hove, Contich, Remixem, Lierre, Athus, and Longlier. Particulars (Cahier des Charges Special No. 3-565) for 7 francs 60 centimes from Régie des Télégraphes et des Téléphones, Brussels.

China.—CHINESE GOVERNMENT PURCHASING COMMISSION.—L.p. cable and d.c.c. copper wire. (See this issue.)

Dumfriesshire.—August 14th. County Council. Supply and erection of 33-kV and 11-kV overhead distribution lines. (See this issue.)

East Lothian.—July 23rd. County Council. Works, including electric lighting (one contract), for housing scheme. Specifications from county architect, Haddington.

Egypt.—CAIRO.—August 24th. Ministry of the Interior. Electric lighting installation for the town of Akhmim, near Sohag. (A.X. 10970.)*

August 20th. Two step-down power transformers of 50 kVA and accessories for the Assiout power station. (A.X. 10985.)*

September 2nd. 125-kVA motor generator, Diesel engine, switchboard, &c., for Delta Barrage spinning factory. (A.X. 10984.)*

August 3rd. 600 meters of various kinds for Menond and Kafr-el-Cheikh. (A.X. 11004.)*

August 13th. One 40-kVA and one 20-kVA air-cooled three-phase transformers for Zifta Municipality. (A.X. 11001.)*

Glasgow.—August 12th. Gas Department. Static condensers. (July 10th.)

India.—SIMLA.—August 4th. Indian Stores Department. Electric lamps for the period October 15th, 1931, to October 14th, 1932. (A.X. 11010.)*

Inverkeithing.—Town Council. Electric lighting of housing scheme. Schedules (£1 1s. deposit) from Mr. R. H. Motion, architect, Union Bank Chambers, High Street, Dunfermline.

Inverness.—July 18th. Burgh Council. Electric lighting in five blocks of houses, South Kessock. Schedule from Mr. A. F. Mackenzie, burgh surveyor.

Irish Free State.—(CORK).—July 28th. City Council. Electric lighting of Public Health Offices, Parnell Place. Specification and form of tender from city engineer's office.

Irvine (AYRSHIRE).—July 27th. Town Council. Electrical work for housing scheme. Specifications from Mr. R. Frew, architect, High Street, Irvine.

Leeds.—July 23rd. City Libraries and Arts Committee. Electric lighting installation at Sheepscar, Headingley, Chapel Allerton and Holbeck Branch Libraries. Specifications from Mr. J. E. Ackfield, city engineer, Municipal Buildings.

London.—CENTRAL ELECTRICITY BOARD.—July 20th. Central indication and telephone equipments for the Mid-East England Electricity Scheme. (June 19th.)

August 10th. 35-kV switchgear at Padiham and Burnley for North-West England and North Wales Electricity Scheme. (See this issue.)

OFFICE OF WORKS.—July 23rd. (a) Mechanical, and (b) electrical engineering labour in Manchester district. (July 3rd.)

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—August 10th. Supply and erection of a 33-kV overhead line in Kent. (See this issue.)

New Zealand.—WELLINGTON.—Post and Telegraph Department. August 28th. 500 microtelephone handles. (A.X. 10980.)*

September 2nd. 100 telephone bell gongs. (G.X. 10562.)*

September 3rd. Telephone transformers transmitters, earpieces, mouthpieces, &c. (A.X. 11007.)*

September 8th. 1,000 three-way telephone plugs. (A.X. 11006.)*

Northern Ireland.—BELFAST.—August 12th. Electricity Board for Northern Ireland. L.p. distribution systems in Comber and Newtownards, Co. Down. (See this issue.)

August 17th. Sub-station equipment, including transformers, switchgear, meters and distribution boards. (See this issue.)

Ogmore and Garw.—July 24th. Electricity Department. Alterations to an existing 11,000-V overhead transmission line. (July 10th.)

Panama.—Diesel-electric generating plant developing from 100 to 125 h.p. (G.X. 10521.)*

Siam.—BANGKOK.—August 15th. Post and Telegraph Department. 33,000 metres of coil-loaded underground armoured cable for combined services, including picture transmission, broadcasting, telegraphy and telephony. (A.X. 11022.)*

South Africa.—KLERKSDORP.—August 7th. Municipal Council. Power station and distribution network. (A.X. 10983.)*

DURBAN.—July 31st. Corporation. Four 500-kVA transformers. (A.X. 10999.)* 11,000-V ironclad switchgear for Clairwood sub-station. (A.X. 11009.)*

Turkey.—ISTANBUL.—August 22nd. Administration of Posts, Telegraphs and Telephones. 100,000 metres of field telephone cable. (A.X. 11017.)*

Uruguay.—MONTEVIDEO.—August 5th. State Electricity Works. Transformers. (A.X. 11008.)*

Walton-on-Thames.—July 30th. Urban District Council. 10,250 yards of e.h.p., h.p. and l.p. cables, including trenching and temporary reinstatement. (See this issue.)

Worsley.—July 24th. Urban District Council. Electric lighting required in houses erected by Council at Walkden, Boothstown, and Roe Green. Specifications (£1 1s. deposit) from Mr. James Howard, Council Surveyor, Town Hall, Walkden.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aberystwyth.—Education Committee. Accepted:—
Installation of electric lighting at Aberystwyth school.—A. W. Miller.

Chesterfield.—Town Council. Accepted:—
Cable (£290).—W. T. Glover & Co., Ltd.
Lighting installation in Market Hall (£115).—H. C. Bates.

Glasgow.—Health Committee. Recommended:—
Cable at Stobhill Hospital (£211).—Craigpark Electric Cable Co., Ltd.
Electricity Committee. Recommended:—
Three motors rewound; 27 new motors and erection of plant (£2,592).—Hapland Engineering Co., Ltd.
Housing Committee. Recommended:—
Electrical installation at 84 houses in rehousing sites (£348).—D. Henderson.
Electrical installation at 60 houses at Polmadie estate (£238).—F. M'Cready.
Transport Committee. Recommended:—
Pumps for subway.—Drysdale & Co., Ltd.
Lagging for steam and condensate piping at Pinkston.—Sutcliffe Bros. & Bryce, Ltd.
Illumination of switchboard at Pinkston.—Holophane, Ltd.
Education Committee. Recommended:—
Electric lighting at Springfield central school (£728).—Walter Bennet, Ltd.

Lamp Contract.—The Belfast City Tramways Department has placed a contract with Siemens Electric Lamps & Supplies, Ltd., for a supply of electric lamps from July 1st, 1931, to March 31st, 1932.

London.—L.C.C. Accepted:—
Electric lift at technical institute, Deptford (£195).—Marryat & Scott, Ltd.
Education Committee. Recommended:—
Electric lighting installation at Droop Street school, Paddington (£418).—Berkeley Electrical Engineering Co., Ltd.
Main Drainage Committee. Accepted:—
Supply, laying, jointing and connecting up of cables, &c., for the additional purification plant at the Council's northern outfall works (£2,281).—Harland & Wolff, Ltd.

Manchester.—Electricity Committee. Accepted:—
Supply of materials for 12 months:—
Junction boxes and socket bends.—A. & W. H. Bury, Ltd.
Street lanterns and globes.—Revo Electric Co., Ltd.; Butterworth Bros., Ltd.
Dry batteries, &c., for flash lamps.—Siemens Electric Lamps & Supplies, Ltd.; Ever Ready Co. (Great Britain) Ltd.
Service cut-outs.—W. Lucy & Co., Ltd.; Sykes & Dyson, Ltd.; Siemens Bros. & Co., Ltd.; Parmiter, Hope, and Sugden, Ltd.
Auto-transformers and auto-balancers.—Crompton Parkinson, Ltd.
Insulators.—Electric & Ordnance Accessories Co., Ltd.; Gaskell & Grocott; Doulton & Co., Ltd.; Bullers, Ltd.
Trifurcating boxes.—British Insulated Cables, Ltd.; W. & J. Lawley, Ltd.; Sykes & Dyson, Ltd.; Forrest & Sym.

Portsmouth.—Electricity Committee. Recommended:—
Boiler plant (£46,848).—Babcock & Wilcox, Ltd.
Two 400-kVA transformers (£151 each).—Metropolitan-Vickers Electrical Co., Ltd.
Two 200-kVA transformers (£99 each).—Hackbridge Electric Construction Co., Ltd.

Rugby.—Urban District Council. Accepted:—
L.p. cable (£1,218).—Derby Cables, Ltd.
H.p. cable, service cable, and l.p. cable (£6,670).—W. T. Henley's Telegraph Works Co., Ltd.

Staffordshire.—County Education Committee. Accepted:—
Installation of electric lighting at Brownhills central school (£360) and at Tamworth school (£491).—W. G. France.
Electrical wiring and fittings at Clothier Street School, Willenhall (£197).—Midland Electric Power Installation Co.

Winchester.—Town Council. Accepted:—
Automatic traffic control signals (£271).—Automatic Telephone Co., Ltd.

Wrexham.—Rural District Council. Accepted:—
Wiring 78 houses for electric lighting (£504).—Messrs. Thornton.

Forthcoming Events

Institution of Electrical Engineers (London Students' Section).—July 18th-28th. Italy and Switzerland. Summer meeting.

International Congress of Radiology.—July 26th-31st. Sorbonne, Paris.

Electrical Association for Women.—Tuesday, July 21st. 1.45 p.m. Visit to the L.C.C. central tramcar repair depôt, Greenwich.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

ECLIPSE electric kettles.
VIVOS vacuum cleaner.
OSRECO testing set.
WHIRLDRY electric washer.

Notes

The O.L.A. Summer Meeting

The summer meeting of the Overhead Lines Association was held last week-end in Scotland. About 50 members and their ladies took part and on the Sunday a golf competition was organised at Bogside, Mr. J. G. Griffin being the winner of the cup, which is to be played for annually. On the Monday the Kilmarnock power station and the northern area of the Ayrshire Electricity Board were inspected (Mr. W. C. Bexon is chief engineer of the Board and president of the O.L.A.). Luncheon was partaken of at Largs and a special steamer trip to the Kyles of Bute was arranged for the ladies of the party. The official dinner took place at Ayr. "The King" was proposed by Provost Matthew Smith. "The O.L.A." was proposed by Col. Maclachlan and replied to by Mr. W. C. Bexon for the Association and by Brig.-Gen. Walker for the Board. "Rural Development" was proposed by Mr. H. M. Poe, and replied to by Mr. W. Fennel. "The County of Ayr" was proposed by Major T. Rich and the Dean of Guild John McIntyre replied. A vote of thanks to the Board was proposed by Mr. Jocelyn Swan. On the Tuesday the southern portion of the Board's area of supply was inspected, and after luncheon more golf was played at Turnberry, a return to Ayr being made in time for dinner.

Faraday Centenary Celebrations

It is hoped that the activities of the Electrical Development Association towards getting the major Faraday Centenary celebrations in London on September 21st and following days supplemented by local efforts throughout the country will have their deserving reward. One direction in which every town can emphasise this important occasion is by arranging for the flood lighting of one or more of the most important buildings in its locality, and the Association is, therefore, writing to all town clerks stressing the importance of the Centenary and asking them to suggest to their councils that some such scheme should be carried out, and inviting them to approach their local electrical undertakings on the subject. It is pointed out that the flood lighting apparatus would no doubt be found very useful for many other occasions in the future, but in view of the fact that there is already a large demand for this type of equipment in connection with the extensive flood-lighting schemes which are to be carried out in London and other large towns to be visited by the International Illumination Congress, it is necessary for orders to be placed without delay. Up to July 10th positive replies had been received from Cheltenham, Cardiff, Southend-on-Sea, Hull, Ilford, Liverpool, Cannock, Middlesbrough, Ripon, Bury, and Barrow-in-Furness.

"Delta" Metals

The term "Delta" is used to cover a wide range of metals and alloys, of which the following are of most interest in electrical and mechanical work: bronzes Nos. 1 and 4 are of great mechanical strength and are practically incorrodible, even in sea and corrosive mine water; they are used for the construction of pump parts (*e.g.*, rams and shafts) and for outdoor switchgear, &c., where bolts of great strength, combined with freedom from corrosion, are required. Bronze No. 2 (silver bronze, a malleable alloy of silver), white in colour, of great strength, is suitable for the manufacture of instruments, switchboard mouldings, and ornamental work. The following test data refer to extruded bars:—

Description of metal.	Diameter in inches.	Area sq. in.	Ultimate strength tons sq. in.	Elongation per cent. on 2 ins.	Reduction of area per cent.
Delta bronze No. 1 ...	0.502	0.1979	50	26	24.9
Delta bronze No. 2 ...	0.500	0,1963	42.5	14	—
Delta bronze No. 4 ...	0.500	0,1963	37	27	20
Delta bronze No. 5E ...	0.500	0.1963	28.2	28 on 1.77 in.	61

Copper is made in various grades, such as high conductivity for electrical work, and arsenical for firebox stays, forgings, &c.; the former have a conductivity of 100.3 per cent. of the standard. Rods and bars are made by the extrusion process, which is claimed to be entirely free from all rolling defects, and also to be more homogeneous, the surface having a very high finish. Section metal, either solid or hollow, is principally made by the extrusion process, an invention of the Delta Metal Co.; by this process the metal, whilst in a plastic condition, is forced under great pressure through a die having the required cross section. This compression of the metal in a plastic state, which must of necessity act throughout the body of the metal instead of merely on the surface, as in the rolling process, adds greatly to its strength and homogeneity.

Pivots and Jewels

The conditions of service of a pivot and jewel bearing are very severe; intense pressure must be supported and yet relative motion of pivot and jewel must be accompanied by minimum friction. There is the further requirement that continued service without deterioration is necessary over considerable periods of time.

The design and manufacture of pivot and jewel bearings which will give efficient service under these stringent conditions presents many problems of considerable theoretical interest and of great industrial importance. Such bearings are used not only in compasses, but also in many other instruments, for example, voltmeters, electricity meters, watches, &c., which are used in very large numbers and the reliability of which depends on the proper functioning of their pivot and jewel bearings.

An investigation of these problems has been undertaken at the National Physical Laboratory, and an account of the work has been published ("An Investigation of Problems Relating to the Use of Pivots and Jewels in Instruments and Meters," by V. Stott, B.A., F.Inst.P., National Physical Laboratory, Collected Researches, Paper I, Vol. XXIV, published by H.M.S.O., price 4s. net). The paper consists of 55 pages of text and numerous diagrams and plates. It contains many interesting features, including results of experiments on the loading of pivots, theory of pivot friction, details of a very simple and accurate method of measuring friction, and results of experiments on wear and lubrication. During wear tests it was found that whenever a steel pivot was rotated in contact with a sapphire jewel in the absence of lubrication a heavy deposit of rust developed. It was actually formed as the pivot rotated and did not develop in the absence of relative motion between pivot and jewel. The increase of friction during the wear test was largely due to the presence of this rust, which forms on "stainless" steel pivots on rotation exactly as on ordinary steel pivots.

Two important results emerged from the experiments on lubrication. First, it was found that the presence of oil made no appreciable difference to the friction between a new pivot and jewel. This fact had previously been established by other workers and, on the basis of this result, it has sometimes been recommended that jewel bearings should be run without lubrication on the grounds that the initial friction is not reduced by the presence of oil and that the oil eventually increases the friction by collecting dirt or becoming resinous. Further experiments were carried out, however, in which a pivot was rotated in contact with a stationary jewel under conditions similar to those existing in an electricity meter. Two identical bearings were used, but one was run dry and the other lubricated. It was found that whereas the first had a useful life of only half a million revolutions the lubricated one had a useful life of fifteen million revolutions. Hence, although lubrication does not decrease the initial friction of a pivot and jewel bearing, it does materially increase the useful life of the bearing. The work so far carried out has opened up the possibility of further lines of research and it is hoped to continue the investigation.

House Magazines

The first anniversary number of "Helios," the house organ of the British Power & Light Corporation, may be recommended for perusal to electrical engineers who wish for a change from electrical engineering. Though it contains many interesting articles by well-known writers, none of these are in any way technical and are therefore eminently suited to holiday reading.

The summer number of "Philips' House Magazine," published by Philips' Social and Sports Club, gives a special illustrated account of the annual sports day held at the club's ground at Rose Hill, Morden, last month. There are also a number of interesting and amusing articles.

I.E.E. Hampshire Sub-Centre

The second annual summer meeting of the Hampshire Sub-Centre of the Institution of Electrical Engineers was held at Portsmouth and Winchester. The Dockyard was visited, and the party shown over the generating station, H.M.S. *Victory* and *Iron Duke*. At luncheon approximately 60 members and friends were joined by the Lord Mayor and Lady Mayoress (Councillor W. Gleave and Mrs. Gleave) and Rear-Admiral Kitson (Admiral-Superintendent of the Dockyard). The speech of the chairman of the Sub-Centre (Mr. W. G. Turner, electrical engineer to the Southampton Corporation) was replied to by Mr. C. C. Paterson, president. Mr. B. Handley, engineer and manager, City of Portsmouth Electricity Department, proposed "The Visitors," and thanked Mr. H. Hunt, superintending electrical engineer, H.M. Dockyard, and the Admiral-Superintendent for the facilities granted to the members. After luncheon the party proceeded by motor-cars to Winchester and inspected the Cathedral and College. Tea was taken at the Guildhall at the invitation of the Mayor of Winchester (Councillor W. Hamblin, J.P.), who, with the Mayoress, received the party on arrival.

Generation of Electricity, June, 1931

The official returns rendered to the Electricity Commissioners show that 776 million kWh were generated by authorised undertakers in Great Britain during the month of June, 1931, as compared with the finally revised figure of 709 million kWh in the corresponding month of 1930, or an increase of 9.4 per cent.

During the first six months of 1931 up to the end of June, the total amount of electricity generated by authorised undertakers was 5,630 million kWh, as compared with the finally revised figure of 5,421 million kWh for the corresponding period of 1930, representing an increase of 3.8 per cent.

H.p. Expansion Circuit Breakers

At a meeting recently at Siemensstadt, Germany, to inspect further developments of the Siemens Schuckert Werke expansion switches Dr. Kesselring said a series of these new oil-less high-capacity circuit breakers had been developed for pressures of from 3,000 to 200,000 V, and Herr Pauzerbieter presented a part survey of development with regard to new forms of switchboard assembly to accommodate such breakers of the open and metal-clad as well as outdoor types. The outstanding advantages of such switchboards were shown to be their simple and easily-surveyed assembly, their small space requirements as compared with switchboards with oil circuit breakers, and, above all, their freedom from fire and smoke risks. A 100-kV outdoor expansion circuit breaker was shown to interrupt a load of 700,000 kVA in one-fiftieth of a second. The quenching action of the steam in these circuit breakers is so intense that the circuit breaker in question had no difficulty in interrupting the circuit perfectly satisfactorily at 200 kV.

South Africa's Electricity Users

Owing to the great extension of the combined tariff for lighting, heating and cooking in the principal towns of South Africa, the Office of Census and Statistics made investigations during the month of September last, and the following results are now available showing the number of private consumers and the average consumption of each :—

Town.	Number of Domestic Consumers.	Average Consumption of each, kWh.
Johannesburg	26,325	56.7
Cape Town	22,303	61.5
Durban	13,723	235.2
Pretoria	8,206	97.5
Bloemfontein	2,834	101.1
Kimberley	2,826	40.7
Port Elizabeth	6,033	61.4
East London	2,340	51.1
Pietermaritzburg	1,858	107.9

The average charge per kWh per consumer was lowest in Durban with 0.989d., and highest in Kimberley at 4.948d., but since the census was taken Kimberley has adopted a combined tariff. At Johannesburg, which had the largest number of consumers, the average charge was 2.862d., Cape Town, with the second highest number, having an average charge of 2.690d.

Electrical Hotbeds

Small hotbed heaters are proving to be good load builders on rural lines and very satisfactory for plant propagation in the U.S.A., the *Electrical World* states. Metal trays 30 by 40 in. in size, having a 200-watt nichrome heating element thermostatically controlled, serve as a heating medium for four plant boxes. Connection is made to any lamp socket and several trays are connected to the same thermostat if like temperatures are desired in all boxes. Check meters show each tray consumes from 2 to 3 kWh per day. By maintaining temperatures at from 60 to 70 deg. one florist was able to root 95 per cent. of his plants in fifteen days, whereas under former methods only 40 per cent. rooted in three months.

Power and Fuel

"Power and Fuel" is the title of a pamphlet issued by the Co-operative Party. Without expressing any opinions on the political and financial views expressed or upon the scheme of salvation offered from the anomalies of our present situation by the formation of a "National Power Board," it can be said that the pamphlet represents an intelligent and intelligible survey of electricity supply and fuel problems, which can be read with profit by anyone wishing to know the essential, technical and historical data. The latter are accurate and are set out logically and clearly in a manner that will appeal to those unacquainted, or only slightly acquainted, with the developments of the past few years.

Fitting by Expansion

Fitting by expansion instead of by shrinking in the assembly of mechanical parts has, a correspondent informs us, been employed in America. Its particular field of adoption, for the moment, is the "expansion" of bushes in locomotive parts. The bush is made the requisite fraction of an inch larger than the hole into which it is to be fitted, instead of the hole being expanded by heat to a sufficient extent to admit an easy entrance of the bush to the hole; the bush is immersed in liquid air, its diameter being reduced thereby. Just a few minutes immersion of the bush is adequate for its necessary contraction. Subsequently the return from liquid air temperature (about 312 deg. F. below zero) to normal effects a tightening of the bush in the hole, needing, in a tested instance, quite 30 tons to remove it.

Educational

UNIVERSITY COLLEGE OF SWANSEA.—Complete courses are provided in civil, mechanical, and electrical engineering and metallurgy. Entrance scholarships are to be offered for competition in April, 1932. Particulars concerning admission to the College and of entrance scholarships may be obtained from Mr. Edwin Drew, registrar, University College of Swansea, Singleton Park, Swansea.

(See our advertisement pages to-day.)

Appointments Vacant

Constructional superintendent for Leicester Electricity Department.

Assistant mains engineer for Norwich Electricity Department.

Shift engineer for Darwen Electricity Department.

Lecturer on elementary electrical engineering for evening classes at the Borough Polytechnic, London.

(See our advertisement pages to-day.)

Electricity in Rural Areas

A meeting of the Conference on Electricity Supply in Rural Areas was held on July 14th at the offices of the Electricity Commissioners and was attended by representatives of the Incorporated Municipal Electrical Association, Incorporated Association of Electric Power Companies, Provincial Electric Supply Committee, Institution of Electrical Engineers, British Electrical Development Association, Electrical Association for Women, Rural Industries Bureau, National Farmers' Union, Central Landowners' Association, Land Agents' Society, Surveyors' Institution, Royal Agricultural Society, Development Commission, Central Electricity Board, the Government Departments concerned, and by other persons interested in the various aspects of rural electrification. Consideration was given to a summary of the action taken by the Commissioners, authorised electricity undertakers, and others since the date of the last meeting of the Conference (July, 1930) with a view to stimulating the development of the supply of electricity in rural areas. The principal matters discussed were reports as to the progress made with the Bedford and Norwich demonstration schemes and the preparation of a standard wayleave agreement.

Energy Used in Chemical Processes

Various electrolytic and electrothermic factors affect the efficiency of chemical processes, such as raising to temperature in furnaces, heat of formation, primary product reacting with bodies at the electrode, radiation, current leaks and short circuits. The power demands are, therefore, often far removed from the theoretically simple value computed from Faraday's law. The power consumption in various electrochemical processes is given in the *Electrical World* as follows.

Electrolytic processes.	kWh per ton.
Aluminium	25,000 to 30,000
Cadmium	1,600 to 2,500
Caustic soda, 1.1 tons	2,600 to 3,200
Chlorine, 1 ton	2,600 to 3,200
Chloral	13,000
Cerium	18,000
Copper refining	180 to 300
Copper leaching	2,000 to 2,800
Gold	300
Iodoform	1,500
Iron (refined)	3,600
Lead (refined)	80 to 100
Lead (basic arsenate)	450
Lead (white)	250 to 300
Magnesium	17,000 to 27,000
Nickel (extracted)	3,200 to 3,800
Nickel (refining)	1,100
Para-amina-phenol	18,000 to 20,000
Potassium chlorate	6,400
Silver	600 to 800
Sodium	15,000
Sodium chlorate	7,200
Tin refining	1,800
Zinc refining	2,800 to 3,100
Hydrogen, 7 cu. ft. per kWh.	
Oxygen, 3.5 cu. ft. per kWh.	
Electrothermic processes.	
Alundum	2,000 to 3,000
Barium oxide	1,200
Brass melting	180 to 340
Calcium carbide	2,500 to 3,000
Calcium cyanamid	4,000
Carborundum	7,600 to 9,000
Carbon bisulphide	850 to 1,100
Ferro-chromium, 70 per cent.	8,000
Ferro-Manganese, 70 to 80 per cent. ...	4,500 to 5,000
Ferro-molybdenum, 60 per cent. ...	8,000
Ferro-molybdenum, 70 per cent. ...	9,000
Ferro-nickel, 55 per cent.	12,000
Ferro-silicon, 50 per cent.	4,000 to 6,000
Ferro-silicon, 75 per cent.	10,000 to 14,000
Ferro-tungsten, 70 per cent.	6,000 to 7,500
Ferro-uranium, 40 per cent.	8,000
Ferro-vanadium, 35 per cent.	7,000
Graphite	3,000
Pig iron	2,000 to 2,700
Synthetic iron	650 to 800
Phosphorus	11,000 to 12,000

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir Geoffrey Clarke, C.S.I., O.B.E., joint managing director of the Telegraph Construction and Maintenance Co., Ltd., was recently elected chairman of the Council of the London Chamber of Commerce. Sir Geoffrey, who is also a director of the Calcutta Tramways Co., Ltd., entered the Indian Civil Service in 1895. He became Postmaster-General of the Punjab in 1903, and in 1918 was appointed Director-General of Posts and Telegraphs in India. In this capacity he represented the Indian Government at the International Telegraph Conference, Paris, in 1925.

Sir Geoffrey Clarke, C.S.I., O.B.E., who has been elected chairman of the Council of the London Chamber of Commerce *(Photograph by Elliott & Fry)*

Mr. G. C. Maclean, assistant engineer and manager of the Inverness Town Council's electricity undertaking, has been appointed manager for a period of twelve months, in succession to the late Mr. C. A. Grut.

Mr. Norman Ramsey, an electrical engineer with the East African Power and Lighting Co., was recently married at Oldham to Miss Elsie Bell.

Mr. J. A. Ready, of Toronto, has been elected a director of the Mexico Tramways Co. in the place of Mr. G. T. Clarkson, who has retired from the board.

We reproduce herewith the portrait of **Mr. A. B. Hart**, who, as was reported in our last issue, has succeeded Mr. E. H. Shaughnessy as assistant engineer-in-chief of the Post Office. Mr. Hart entered the service as a telegraphist in 1893 and was transferred to the engineering side three years later. He rose through the various grades of the department and eventually became a second-class staff engineer. He joined the transmission group in 1909, later taking over the control of the group. For seventeen years he was concerned with the development of the underground trunk network, introducing loading and superintending the installation of a chain of repeater stations. Since 1928 he has been in charge of the Lines Section of the Post Office Engineering Department.

Mr. A. B. Hart, the new assistant engineer-in-chief of the G.P.O. *(Photograph by H. Connold, East Grinstead)*

Sir George Sutton, Bt., was the subject of a glowing tribute by Mr. J. Lamont at Henley's annual meeting last Friday. In acknowledging this, Sir George announced that he was not sure, but it was very likely, that that meeting would be the last over which he would preside. He had had a long innings and, although he might not preside at the next meeting, he hoped to meet the shareholders again on many future occasions.

Mr. H. W. Edwards, borough electrical engineer of Oswestry, has had his salary raised from £450 to £475 per annum, with a further increase to £500 as from April next. At the same time the price of electricity in Oswestry is being reduced by a halfpenny per unit. Mr. Edwards was "taken over" by the Corporation when it acquired the undertaking from the local company a year or two ago.

Two Dublin electrical engineers are retiring from the service of the Electricity Supply Board at the end of July, namely, **Mr. S. L. Price**, who has been in charge of the Pembroke electricity undertaking, and **Mr. G. F. Pilditch**, who held a similar position in Rathmines. The areas of these two townships have been amalgamated with the Greater Dublin electricity undertaking, the engineer-in-charge of which is **Mr. Patrick Harkin.**

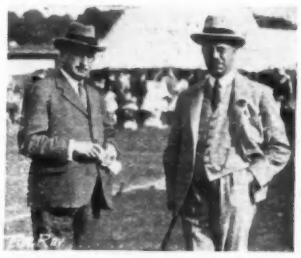
Mr. Charles Mitchell, joint vice-chairman and managing director of Dorman, Long & Co., Ltd., has been appointed chairman of the company in place of the late Sir Hugh Bell. Mr. Mitchell is a director of the Sudan Light and Power Co., Ltd., in which Dorman, Long & Co. are interested.

Mr. H. Faraday Proctor and Mr. J. W. Beauchamp at Portishead (Bristol) power station

The engineering staff and wayleave officers attached to the District Office of the South-West England and South Wales Area recently celebrated their first anniversary of coming to the area by a visit to the Portishead generating station. The party numbering 27 was accompanied by Mr. J. W. Beauchamp (District Engineer to the Central Board), and was received at Portishead by Mr. H. Faraday Proctor (chief engineer and general manager, Bristol Electricity Department). These two well-known gentlemen appear in the illustration to this note. At the conclusion of the visit tea was taken in the control room, and Mr. Beauchamp proposed a vote of thanks to the Bristol Corporation, which Mr. Faraday Proctor acknowledged. The South-West England Area is one of the largest areas in the "grid" scheme, and during the past year the progress made has been remarkable. Contracts have been let for switchgear, transmission lines and transformers, and wayleaves covering a very large proportion of the area have been obtained. In addition, the offices in Oakfield Road, Clifton, have been completely equipped.

Mr. H. W. Barber, district manager for Messrs. Johnson and Phillips, Ltd., and in charge of their Manchester and Liverpool branches, has been elected unopposed to the Southport T.C. for Birkdale West Ward.

The accompanying picture is reproduced from a photograph taken at the annual sports meeting of Standard Telephones and Cables, Ltd., held at Hendon on Saturday last. It shows **Mr. H. M. Pease** (vice-chairman of the company) on the left and **Mr. E. S. Byng** (managing director) who took a keen interest in the day's events.



Messrs. Pease and Byng at the "Standard" Sports

The photograph which we reproduce herewith was taken on the occasion of a recent meeting at the Ferrybridge station (Yorkshire Electric Power Co.) of the North Midland Area Committee of the British Electrical Development Association. The members of the Committee were welcomed by Col. H. C. Fraser and conducted over the station by Mr. H. Hobbs, the resident engineer, who gave full particulars of the station's four-and-a-half years' operation. Mr. T. Roles, city electrical engineer, Bradford, the chairman of the Committee, presided at a luncheon which preceded the business meeting and Mr. A. C. Cramb, director and secretary of E.D.A., was present.

At the Ferrybridge Station. (Seated) Mr. T. Wilkinson (Leeds), Mr. W. R. T. Skinner, Col. H. C. Fraser (Y.E.P.), Mr. T. Roles, Mr. A. C. Cramb, Mr. C. F. Wells (Y.E.P.), and Mr. N. McLean (Harrogate) *(Photograph by R. H. Pickard, Leeds)*

In our reference to the pending retirement of the Shipley borough electrical engineer last week, we incorrectly gave his name as Mr. T. J. Gray, while actually it is **Mr. William Redman.**. We are now informed that **Mr. H. Haigh**, of Gainsborough, has been appointed to succeed Mr. Redman as from September 1st next. Mr. Haigh, who is 32 years of age, was born in Bradford. He was articled to the borough electrical engineer of Morecambe and later became mains superintendent in the Morecambe Electricity Department. In 1927 he was appointed engineer and manager of the newly-established Gainsborough undertaking.

Obituary

Mr. E. C. de Segundo.—We regret to learn of the death, on July 8th, of Mr. Edward Carstensen de Segundo, who at one time was a contributor to the ELECTRICAL REVIEW and was well known in the industry. Nearly forty years ago he wrote a booklet on "Domestic Electric Lighting," in which the costs of gas and electricity were compared. It was published from these offices and had a continuous sale for many years. In 1902 he introduced to this country an artificial gutta percha (a substance which 20 years' experimenting had failed to produce before), and was connected with the formation of the New Gutta Percha Co., Ltd., later the Greenwich Cable Works, Ltd., and now the Croydon Cable Works, Ltd. In a report which appeared in the ELECTRICAL REVIEW of July 18th, 1902, the new gutta percha was said to be fully equal, if not superior, to the natural material and, moreover, its cost was less than half of the current price of natural gutta percha. The company was formed in the same month and Mr. de Segundo maintained his connection until 1911. During the war, Mr. de Segundo, who was an ardent Roman Catholic, advocated the intervention of the Pope to bring hostilities to an end.

Mr. G. J. Massey.—We regret to report that Mr. George J. Massey, who was in charge of the Engineering Section of Callender Cable Company's works at Belvedere, Kent, passed away on Tuesday last. Mr. Massey had been in the service of the company for nearly 30 years, and his striking personality, geniality, and extreme good nature, made him well known and popular throughout the whole of the electrical industry. His death at the comparatively early age of 53 will be deeply deplored by a very wide circle of friends.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Bonham Electrical & Engineering Co., Ltd.—Private company. Registered July 4th. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrical engineer carried on by J. Bonham at 57, Stephenson Street, Willington Quay-on-Tyne. The first directors are: V. O. James, 1, Elmwood Road, Monkseaton; L. A. Whitfield, Exchange Buildings, Newcastle-upon-Tyne; and J. Bonham, 8, Hylton Terrace, North Shields. Registered office: 57, Stephenson Street, Willington Quay-on-Tyne.

Nottingham Rediffusion Service, Ltd.—Private company. Registered July 8th. Capital, £6,000 in £1 shares (3,000 "A" and 3,000 "B"). Objects: To erect, maintain and operate wireless stations for the reception and distribution of broadcast messages and programmes, &c. The first directors are: E. C. Sharp, 35, Addison Gardens, W.14 (managing director of Cecil Sharp, London, Ltd.), and P. P. Eckersley, 22, Hyde Park Gardens Mews, W.2 (consulting electrical engineer). E. C. Sharp is chairman. Secretary: C. Sharp. Registered office: 46-7, London Wall, E.C.2.

Marbourn, Ltd.—Private company. Registered July 7th. Capital, £3,000 in 2,900 7½ per cent. cumulative preference and 100 ordinary shares of £1. Objects: To carry on the business of manufacturers of and dealers in electrical goods and fittings, &c. The permanent directors are: A. E. Bourne, 18, Corringham Road, Wembley Park, Middlesex; G. E. Marr and R. C. Marr, both of 20, Brampton Grove, Hendon, N.W. Registered office: Block "F," Idris Yard, 120, Pratt Street, Camden Town, N.W.

W. Forrest & Co., Ltd.—Private company. Registered July 4th. Capital, £2,000 in £1 shares. Objects: To acquire the business of a mechanical, electrical and general engineers, &c., hitherto carried on by C. H. Payne at Industry Works, Sylvester Gardens, Sheffield, as "W. Forrest & Co." The directors are: C. H. Payne (permanent managing director), "Normandale," Lawson Road, Sheffield, and S. A. Payne, 53, Windermere Avenue, Church End, Finchley, N.3.

Preh Manufacturing Co., Ltd.—Private company. Registered July 8th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers, electrical engineers, electricians, electrical and general wiring contractors, &c. The subscribers are: Mrs. M. Gray, 214, Hendon Way, N.W.4, and C. Jobson, 319, Watford Way, Hendon, N.W.4. The first directors are not named. Registered office: 150, Charing Cross Road, W.C.1.

Betta Electric Motors (Foreign), Ltd.—Private company. Registered July 6th. Capital, £100 in 60 ordinary and 40 founders' shares of £1. Objects: To acquire licences in respect of certain patents for inventions relating to motor mechanism for sound reproducing machines, to exploit the said inventions, and to adopt an agreement with Royalmotor A.G. (Switzerland), A. Boitel and Rose Morris & Co., Ltd. The subscribers are: O. Ruhl, 50, Roxborough Park, Harrow; A. A. Juviler, 111, Clifton Court, N.W.8; and A. F. Boitel, Werder (Flavel), Germany. A. Boitel is to be the first director. Registered office: 44, Bedford Row, W.C.1.

Henson Radio, Ltd.—Private company. Registered July 7th. Capital, £100 in £1 shares. Objects: To carry on the business of wireless, radio, motor, electrical and mechanical engineers, &c. The subscribers are: C. O. O. Herzog, 11, Ridge Hill, Golders Green, N.W.11, and W. J. Lupton, 53, Athenæum Road, Whetstone, N.20. The first directors are not named. Registered office: 2, Henson Street, E.C.1.

Eunice Radio Co., Ltd.—Private company. Registered July 6th. Capital, £500 in £1 shares. Objects: To acquire the business of a wireless telegraphy component and gramophone and musical instrument manufacturer and dealer now carried on by E. Abrams, trading as the Eunice Radio & Gramophone Co., at 135 and 80, Alfreton Road, Nottingham, and at Derby. The directors are: Edward Abrams and Eunice Abrams, both of 80, Alfreton Road, Nottingham.

Edward Roberts, Fergusson & Co., Ltd.—Private company. Registered July 4th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless sets and accessories, &c. The directors are: C. Fergusson Jenner, 16, Bolton Road, Grove Park, Chiswick, W.4, and E. C. Jenner, 20, Morley Road, Twickenham, Middlesex.

Rolls-Caydon, Ltd.—Private company. Registered July 13th. Capital, £4,000 in £1 shares. Objects: To adopt an agreement with G. H. Bond, and to carry on the business of manufacturers of radio, electrical or other telephones and telegraphs. The first directors are: T. Thornycroft (chairman), R. W. Cory, C. Farrar, and I. W. D. Black. Solicitors: Kenneth Brown Baker, Baker, Essex Street, W.C.2.

MacEchern & Co., Ltd.—Private company. Registered July 13th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in vulcanized fibre and other insulating materials for electrical and other purposes, &c. F. N. MacEchern (director of Diamond Fibre Co., Ltd.), is permanent governing director. Registered office: 38, Southwark Bridge Road, S.E.1.

Returns of Electrical Companies

Lancashire Electric Light and Power Co., Ltd.—Particulars filed of £1,400,000 debenture stock (inclusive of £1,000,000 already registered) authorised by resolutions of June 16th, 1927, and May 18th, 1931, and covered by trust deed dated June 18th, 1931 (supplemental to trust deed dated July 21st, 1927) the amount of the present issue being £400,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. Trustees: Sir Bernard E. Greenwell, Bt., and C. F. Campbell.

Eltax (British), Ltd.—C. Waller, of 27, Fitzroy Square, W., was appointed receiver and manager on June 26th, under powers contained in debenture dated February 10th, 1931.

W. L. Gray, Ltd.—Capital, £750 in £1 shares. Return dated June 30th, 1930 (filed April 28th, 1931). All shares taken up. £2 paid, £748 considered as paid. Mortgages and charges: £750.

Edison Swan Cables, Ltd.—Capital, £150,000 in 100,000 preference shares of £1 and 200,000 ordinary shares of 5s. each. Return dated April 29th, 1931. 900 preference and 200,000 ordinary shares taken up. £50,900 paid. Mortgages and charges: £242,750.

Cooper, Beard & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 5th, 1930 (filed March 5th, 1931). 501 shares taken up. £500 paid, leaving £1 calls unpaid. Mortgages and charges, nil.

George H. Tozer, Ltd.—Capital, £3,000 in £1 shares. Return dated May 8th, 1931. All shares taken up. £901 5s. paid (being £1 per share on 5 and 15s. per share on 1,195 shares), £1,800 considered as paid on 1,800 shares. Mortgages and charges, nil.

Willet & Robinson, Ltd.—Capital, £7,000 in 3,000 7 per cent. "A" cum. preference, 1,000 8 per cent. "B" preference, and 3,000 ordinary shares of £1. Return dated September 3rd, 1930 (filed May 26th, 1931). 2,150 "A" preference and 2,150 ordinary shares taken up. £4,300 paid. Mortgages and charges: £390.

G. S. Hawker, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1930 (filed April 27th, 1931). 900 shares taken up. £400 paid, £500 considered as paid. Mortgages and charges: £550.

Devereux, Ltd.—Debenture dated June 13th, to secure £20, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: B. H. Roach, 4, Copthall Buildings, E.C.2.

W. H. Porter & Co., Ltd.—Debenture dated June 16th, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital and goodwill. Holder: I. Rosenthal, 12, Rotton Park Road, Edgbaston, Birmingham.

Majestic Distributors (Midlands), Ltd.—Debenture dated June 16th, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital and goodwill. Holders: W. H. Porter & Co., Ltd., 44, Church Street, Birmingham.

H. Norman Kirk, Ltd.—Mortgage dated July 2nd, to secure £4,000, charged on Gower Hall, Gower Place, Swansea. Holder: W. W. Phillips, "Oaklands," Dyke Road Avenue, Hove.

Weston Electric Lamp Co., Ltd.—T. Smith, of 27-8, Finsbury Square, E.C.2, was appointed receiver and manager on June 25th, under powers contained in debenture dated March 25th, 1931.

C. Barnett, Ltd.—F. T. Smith, of 150, Southampton Row, W.C.1, ceased to act as receiver and manager on June 30th.

Martindale Electric Co., Ltd.—Capital, £200 in £1 shares. Return dated January 14th (filed February 20th), 1931. 139 shares taken up. £139 paid. Mortgages and charges, nil.

Precision-Electric, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1930 (filed May 14th, 1931). 100 shares taken up. £100 paid. Mortgages and charges, nil.

Hall Telephone Accessories (1928), Ltd.—Capital, £250,000 in 10s. shares. Return dated February 26th, 1931. 378,000 shares taken up. £69,588 10s. paid. £119,411 10s. considered as paid. Mortgages and charges, nil.

Ernest F. Moy, Ltd.—Capital, £10,000 in 1,500 preference and 8,500 ordinary shares of £1. Return dated November 20th, 1930 (filed March 13th, 1931). All shares taken up. £10,000 paid. Mortgages and charges: £6,000.

Neglin Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated December 13th, 1930 (filed March 20th, 1931). All shares taken up. £500 paid. Mortgages and charges, nil.

Montague Radio Inventions & Development Co., Ltd.—Satisfaction to the extent of £350 on June 30th, 1931, of debentures authorised July 23rd, 1930, and registered August 1st, 1930. (According to the register of mortgages, the debentures registered August 1st, 1930, originally secured £600.)

Hewittic Electric Co., Ltd.—Satisfaction in full on May 21st, 1931, of debentures authorised August 3rd, 1926, and registered August 20th, 1926, securing £20,000.

Excel Radio Units, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1930 (filed May 15th, 1931). 301 shares taken up. £201 paid. £100 considered as paid. Mortgages and charges, nil.

Morris Electrical Co., Ltd.—Capital, £1,000 in 400 preference and 600 ordinary shares of £1. Return dated December 31st, 1930 (filed May 19th, 1931). 50 preference and 402 ordinary shares taken up. £202 paid on 50 preference and 152 ordinary shares. £250 considered as paid on 250 ordinary shares. Mortgages and charges: £200.

Jarrow and District Electric Traction Co., Ltd.—Satisfaction to the extent of £15,000 on July 2nd, 1931, of debentures authorised August 3rd, 1910, and registered August 13th, 1910. (According to the register of mortgages, the debentures registered August 13th, 1910, originally secured £20,000.)

Power Units, Ltd.—Capital, £1,000 in £1 shares. Return dated June 2nd, 1931. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Matchless Radio Manufacturing Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1930 (filed March 17th, 1931). 102 shares taken up. £102 paid. Mortgages and charges, nil.

City Notes

W. T. Henley's Telegraph Works Co., Ltd.

The accounts of this company were reviewed in our issue of July 3rd, p. 32, and the annual meeting was held on July 10th. Sir George Sutton (chairman), who presided, in the course of his speech, said that the accounts showed a special provision of £20,000 for obsolescence of lead presses. The lead press had been improved from time to time, and for some five or six years they had been engaged in designing a press which would do what they desired; they had expended about £20,000 in experimenting, and they had succeeded in producing a press which was far and away superior to any lead press which had hitherto been made. Two of these presses had been in use for a length of time sufficient to satisfy them of their perfect and economical working, and they had decided to scrap all the existing presses and replace them by the new press. They were making this press in England, but not at their own works. Licences were being granted for the manufacture and sale of the press throughout the world, and the firm of Krupp's had become a licensee. The press was patented throughout the world. They had not debited their capital account with anything for the value of the patents, nor for the heavy cost of experiments. Provision had been made for losses which might be made in transmission of money from overseas. The exchanges were against them, but it was their policy to transmit the money whenever they could, without regard to the losses which might be incurred. The large sums they had in Australia could not be remitted to any considerable extent, and they had made a reserve for possible losses when they could be remitted. The Tyre & Rubber Co. was making satisfactory progress. The works had been fully employed all the year, and they had added to its original purpose some new classes of manufactures. The sales for the year in money value were lower during the year under review than they were in the previous year, which was the highest the company had ever had. In quantity the output was very little different from the previous year. The lower profit was due to the lower cost of raw material. They kept very closely in touch with the world trade in their industry in money turnover, and they were satisfied that there was no falling off in the share of trade they were doing as compared with their competitors. The percentage of their total output which was exported overseas was the same as in the previous year, but the money value was lower. As regarded export trade, records showed that British cables had a larger export demand than one-half of the total export of this country and four other principal exporting countries together. The establishment of a cable factory overseas, as a joint enterprise with other cable houses, had been postponed until conditions were more favourable than they were at present. More orders were brought forward than last year, but many of them were not so profit-yielding, nor was the business they had received during the last few months an indication that trade was going to boom. It was not reasonable to bank on increasing the output every year. The financial difficulties of the world, the exercise of economy, and the low level of prices must have its effect on the British cable trade as well as most other industries. That was, of course, taking a short view, a "one-year" view, but looking further ahead they could see that the growth of the demand for electricity would go on, and the increase of electricity generated during the first five months of the current year showed that the hope of an increasing demand for cables was well justified. The report and accounts were adopted.

Anglo-Argentine Tramways Co., Ltd.

Presiding at the annual meeting on July 14th, the Duke of Athol (chairman) said that during the first half of the year under review traffic had continued to show decreases, but the far greater part of the reduction suffered had taken place during the second half of the year. The decrease in traffic receipts for the year was £270,937, which the exchange involved them in a loss of £168,590. The company had had to operate during many years within the narrow limits of an uneconomical fare and in the face of unavoidable new burdens of expenditure, while during the past year it had suffered the consequences of the world-wide trade depression. Another important factor was that of the indescriminate running of numerous omnibuses and taxibuses in competition with the company's lines under less exactly obligations. A lesser contributory cause to their loss of revenue was the weather, which in 1930 had been particularly unfavourable. They had put into service during the year a larger type of car of 40 seating capacity, and improvements had been made to existing cars. The company's renewed petition presented to the municipal authorities of Buenos Aires for tariff readjustments had not yet been granted. The Provisional Government had admitted the seriousness of the company's situation and had appointed a special commission to study the economic and financial situation of the company and also the problem of transport in the City of Buenos Aires. The report and accounts were adopted.

Brazilian Traction, Light and Power Co., Ltd.

The annual meeting was held in Toronto on July 8th, Mr Miller Lash (president) presiding. In moving the adoption of the report and accounts, the president said that the board had declared a quarterly cash dividend of 25 cents per share on the ordinary shares of no par value, payable September 1st, and it hoped to be in a position to declare another cash dividend on the ordinary shares of 25 cents per share, payable December 1st. In addition, as a final dividend for the year, it was hoped to be able to declare, before the close of the year, a stock dividend at the rate of one share for each 50 shares held. He referred to the economic difficulties which Brazil, in common with the rest of the world, was experiencing, and said that the Brazilian Government had taken strong measures to cut down national expenditure in order to balance the Budget. Touching on trade conditions in Brazil, Mr. Lash referred to the favourable trade balance shown for the first four months of 1931, and stated that this must be regarded as satisfactory in view of the fact that it was only slightly less than for the corresponding period of last year. The report and accounts were adopted.

Automatic Telephone Manufacturing Co., Ltd.

An offer has been received from the International Automatic Telephone Co., Ltd., for the acquisition of all the preference and ordinary shares of the company not held by the I.A.T. In a circular to shareholders outlining the proposal, the directors state that the offer which has been received is as follows:—Holders of the 6 per cent. cumulative preference £1 shares are offered 7 per cent. cumulative preference £1 shares in the International Co. on a share-for-share basis. The ordinary shareholders are offered for each ordinary share one ordinary share of £1 in the I.A.T. and 4s. in cash, or, alternatively, 23 International ordinary shares for each 20 shares now held. The new ordinary shares of the I.A.T. will rank *pari passu* with the existing ordinary shares, and will rank for dividend as from December 31st last. The directors state that they consider the offer a fair and reasonable one, and recommend its acceptance.

Ward & Goldstone, Ltd.

The annual meeting was held on July 8th, Mr. M. H. Goldstone presiding. In presenting the report and accounts (ELEC. REV., July 3rd, p. 33), the chairman said the company had had to provide from revenue for substantial losses upon the stocks of raw materials, of which copper, rubber, and cotton were the staple products. Their output of insulated wires, cables, and components exceeded that of previous years. Manufacturing conditions in this country were utterly discouraging. This was due to burdensome taxation and unprotected home markets. The electrical industry if safeguarded against dumping from abroad could take into employment many thousands who were now on the dole; it could not be sufficiently stressed that production costs would be

thereby reduced, thus enabling us to compete still more favourably in the markets overseas. The report and accounts were adopted.

Petters, Ltd.

Presiding at the annual meeting on July 14th, Sir Ernest Petter (chairman), in the course of his speech, said their investments showed a reduction of £10,000, which included a further reserve on their debenture holding in the Ipswich company. This company, Petters (Ipswich), Ltd., was now about to be wound up. Their engine business had suffered from the existing world-wide depression, which had particularly shown itself in the export trade. In past years about 70 per cent. of their business was export, but with markets such as India, Australia, Egypt, the Argentine, as well as several Continental countries, which had been good customers, passing through a period of severe political and financial depression, they could not expect to maintain their sales. They had not relaxed their efforts to maintain their product technically in the forefront in the face of increasing competition, and they were shortly placing on the market important additions to the range of their engine manufactures, from which they had reason to hope that when trade improved increased business would result. Reviewing the national industrial situation, the chairman said he believed that the conditions precedent to the return of prosperity to our country were protection of our home market against foreign competition, an economic confederation of the British Empire, having for its object the securing of Empire trade for the nations comprised, the restoration of unemployment insurance to an actuarial basis, and some measure of amelioration of the interest charges which the country has to bear upon loans created during and arising out of the war. The report and accounts were adopted.

Aron Electricity Meter, Ltd.

The annual meeting was held on July 14th, Mr. H. Kahn (chairman and managing director), presiding. In presenting the report and accounts (ELEC. REV., July 10th, p. 74) the chairman said that the profit of the year showed an improvement on that of last year, in spite of the fact that the London factory had been very much occupied with the production of the new house meter, which had necessitated further reorganisation of their factory and the acquisition of additional automatic machinery. The new meter had been put on the market shortly before the end of the financial year, and had had a successful reception. They had other developments in view, both in London and Vienna. As regards the year 1931-32, it was practically certain that the results of the Taximeter Co. would not be as favourable as those for the past year. Their factory at Vienna, which had completed eight months of its current year, showed a falling off in turnover. As regards the London factory, if the demand for the new house meter continued, and business improved in their large meters, then he had no fear for the result. The report and accounts were adopted.

Edmundsons' Electricity Corporation, Ltd.

The accounts of this company were abstracted in our last issue, p. 74, and the annual meeting was held on July 14th. Mr. F. Massingberd Rogers (chairman), who presided, in the course of his speech, said the undertakings with which they were connected had again increased the net and gross revenue. The sales of electricity were over 89,000,000 kWh, and the income was £1,181,600. Sir James Devonshire had resigned his seat on the board and his appointment as chairman owing to pressure of other duties, and Lord Meston has been elected to the board to fill the vacancy caused by his resignation. Sir James was still connected with some of their associated companies, and they could still count upon the benefit of his long experience and advice. The report and accounts were adopted.

Venezuela Telephone and Electrical Appliances Co.

The directors have notified shareholders that arrangements have been concluded under which all the property of the company in Venezuela has been transferred to and vested in a local company, the Cia. Anon. Nacional Telefonos de Venezuela, in exchange for shares and securities in that company of a nominal amount equal to the value of the property transferred as at December 31st last. The assets of the Appliances Co. now consist almost entirely of securities in Venezuelan companies, and to facilitate the development of the business on similar lines, it is proposed to reorganise. A new company, Telephone Properties, Ltd., is to be formed to take over the present undertaking, with an authorised capital of £900,000 divided into 450,000 preference shares and 450,000 ordinary shares of £1 each. For every four preference shares now held, shareholders will receive four preference and two ordinary shares in the new company. Ordinary and "A" ordinary shareholders will receive five ordinary shares for every four now held. Meetings are to be held on July 31st to consider the scheme of reorganisation.

Telephone and General Trust, Ltd.

On Wednesday last this company offered for subscription 240,000 7 per cent. cumulative preference shares of £1 each at 21s. per share. The company's authorised capital is £1,300,000, of which £1,033,088 has been issued, comprising £306,088 in 7 per cent. cumulative preference shares, £427,000 in non-cumulative 7 per cent. preferred ordinary shares, and £300,000 in ordinary shares. The company has investments in a number of telephone operating, manufacturing and engineering concerns in many parts of the world. It is associated with the International Automatic Telephone Co., Ltd., the Automatic Telephone Manufacturing Co., Ltd., and British Insulated Cables, Ltd., as well as with the General Telephone and Electric Corporation and the Associated Telephone and Telegraph Co. of the United States. The proceeds of the present issue are to be used in the liquidation of loans from bankers and associated companies, in acquiring further interests in telephone companies, and in financing affiliated companies. The list is to close to-morrow (Saturday), or earlier if necessary.

The report of the *National Electric Construction Co., Ltd.*, for 1930 shows a net profit of £33,512, as compared with £24,851 in the preceding year, to which is added £5,221 brought in, making £38,733. Reserve again receives £10,000, and it is proposed to pay a final divided of 5 per cent. and a bonus of 5 per cent., less tax, making 15 per cent. for the year (against 12½ per cent.), leaving £18,852 to be carried forward.

The *Sydney Electric Light and Power Supply Corporation, Ltd.*, reports for the year ended April 30th last a decrease of £10,696 in revenue, but an increase of £4,903 in net profits, which is explained by the lower costs of fuel, and economies. A final dividend of 4 per cent. is being paid, making 8 per cent. for the year and absorbing £63,333.

The report of the *Kalgoorlie Electric Tramways, Ltd.*, for 1930 shows gross receipts of £23,587, as against £22,675 in the preceding year, and net receipts of £4,857. After providing £1,000 for depreciation and £9,858 for debenture service, the debit brought in is increased to £108,520.

The *United Dominions Trust (Electric), Ltd.*, actively functioned as a subsidiary of the United Dominions Trust, Ltd., during the year ended June 30th and earned sufficient to pay off the preliminary expenses (£2,620) and leave £1,477 to the credit of profit and loss account.

The directors of the *Anglo-American Telegraph Co., Ltd.*, have announced interim dividends for the quarter ended June 30th of 15s. per cent. on the ordinary stock and £1 10s. per cent. on the preferred stock, less tax at 4s. 6d. (same).

At a meeting of the *British Electric Traction Co., Ltd.*, on July 10th a resolution was carried that the 18,445 deferred ordinary shares be converted into a like amount of deferred ordinary stock.

The directors of the *Farnham Gas & Electricity Co.* propose to raise further capital by the issue at par of 5 per cent. perpetual debenture stock up to an amount of £10,000, ranking *pari passu* with the existing loan capital.

The *Traction and General Investment Trust* has announced an interim dividend of 6 per cent. on the ordinary shares (same).

The directors of the *Telegraph Construction and Maintenance Co., Ltd.*, have decided, in view of the continuance of depression in trade, not to declare an interim dividend. Last year an interim dividend of 2½ per cent. was paid.

The usual half-yearly dividend on the 5 per cent. class "B" cumulative participating preferred shares is announced by the *Hydro-Electric Securities Corporation.*

The directors of the *Electrical Distribution of Yorkshire, Ltd.*, have announced an interim dividend at the rate of 9 per cent. per annum, less tax (same).

Stocks and Shares

TUESDAY EVENING.

THE hopes which had been entertained of a possible reduction to 2 per cent. in the Bank Rate in the immediate future have been postponed, to put it politely, by the serious financial crisis that has occurred in Germany. This has brought about a return of the depression which had been dispelled in part by the proposal for a war debts moratorium. Stock Exchange prices have not gone back to the panic levels at which they stood on the eve of the Hoover proposal, but a good part of the substantial recovery has been lost, and a serious feeling of disturbance introduced into financial circles by the troubles that have befallen Germany. These have been reflected in the Wall Street Stock Exchange, the Paris and other Continental bourses, and, of course, in London. The heroic measures proposed to save the German situation are expected to prevent national bankruptcy in that country, but their indirect influence is far-reaching, and Stock Exchange business has once more become exceedingly quiet.

Gilt-edged stocks, including those of British Government securities, suffered sharply by reason of the sudden fall in the French exchange. The purely gilt-edged stocks of the electricity sections are, however, little affected. Central Electricity 4½ per cent. debenture is a point up at 98¼, London & Home Counties remains at 98, and London Power 5 per cent. debenture is better at 106. Several new issues are expected to make their appearance before the real start of the holiday season, though the malaise engendered by German trouble exerts its influence upon financial business of very kind, checking enterprise and inducing a cautious sentiment.

Cables & Wireless

On the eve of the publication of the Cables & Wireless report, further selling occurred of the Merger stocks. The 5½ per cent. preference was chiefly affected, a fall of 5 points taking the

price back to 50½. Any expectation which might have prevailed earlier as to the payment of the next dividend, due in September, has now been abandoned or modified in the direction of supposing that the dividend will be less than the full 2¾ per cent. to which the stock is entitled. On the Hoover proposal, the price spurted to 61, but this has proved to be a flash in the pan, and the published traffics continue to be poor. Globe Telegraph & Trust ordinary have weakened to 7½ xd., on the assumption that the company cannot go on paying 8¼ per cent., free of tax, dividend in the face of the poor results published monthly by the Cables & Wireless merger. Marconi Marines have fallen back to 33s. 3d., showing a drop of 3s. 9d. The Telegraph Construction and Maintenance Company announces that, in view of the conditions of trade depression, no interim dividend will be declared. This time last year the rate was 2½ per cent. The shares are £1 down, at 11½. American Telephone & Telegraphs have dropped 10 to 180; International Telephones are 7½ lower at 31½.

Home Railways

Figures were published last week of the proportions in which it is proposed to issue stocks in the new London Transport concern against the securities at present existing in the Underground group. Further statistics are published this week, giving more detailed particulars, but they have had no marked effect upon market prices of the stocks concerned. The only alteration is a decline, to a guinea, in Underground Electric ordinary shares. The demand for prior charge securities is a little less keen than it was, owing to the German imbroglio. Amongst the tramway issues, London & Suburban Traction preference retain their rise of 12s.; London United 4 per cent. debenture is quoted at 62½ xd.

The National Union of Railwaymen, at their conference last week, by unanimous vote declared approval of the electrification of British railways. To bring this about would require, according to the Weir report, some £261,000,000. This would be too large a sum to expect from private sources, and, according to the secretary of the Union, the only logical way out of the difficulty would be for the Government to finance the scheme by utilising the resources of the State, thereby turning the railways into a national asset.

Dollar Stocks

Brazilian Traction Light & Power Company, after making several quarterly payments of dividend in stock, is about to resume cash payments. The annual meeting of the company was held last week in Toronto, and the president announced a cash dividend of 25 cents, plus a stock dividend of one share for every 50 shares held, before the close of the year. The arrangement caused disappointment amongst the stockholders, and the price of the shares has gone back 4¾ to 20½, though, even without such dividend announcement, it is probable that the price would still have crumpled owing to the setback in dollar stocks as a whole. The price of the preference is quoted at 80 to 100. Business was marked last week at 80 and at 90 on the same day.

The Mexico Light & Power Company, and the Mexico Tramways Company, held their meetings, also in Toronto, on the day following that of the Brazilian Traction. The full account of the meetings has yet to reach this country. The price of Mexico Tramways common shares has risen 2½ points to 10 since the beginning of the month. Amongst the utilities issues, it may be mentioned that lower prices are quoted for Power Corporation of Canada at 47½. Shawinigan at 41, and Consolidated Gas & Electric of Baltimore at 90. Barcelona Tractions are down 3 at 12½, the prior-charge issues being equally weak, upon reports that new troubles have occurred in Spain.

Electricity Supply Shares

After this lugubrious recital it is refreshing to be able to comment upon a series of rises in the list of Home electricity supply companies. Improvements are marked against the ordinary shares of the Charing Cross, Chelsea, County of London, St. James', and Westminster companies. Urban ordinary hardened to 28s. 3d., the preference to 24s. North Metropolitan Electric 5½ per cent. debenture (1966) gained a point at 105½. In the provincial group, the trend is similar. Modest improvements have taken Lancashire ordinary to 22s. 6d., Newcastle-on-Tyne preference to 27s. 3d., and Isle of Thanet ordinary to 18s. 3d. Edmundsons' 5 per cent. debenture, at 103, is 1 better. Calcutta Electric ordinary are a trifle lower at 34s. 6d., and Atlas ordinary at 18s. 3d. British Power and Light are neglected; the price is 9s.

Equipment and Manufacturing

G.E.C. ordinary shares have dropped back to 40s. ex dividend; Associated Electrical Industries ordinary, at 20s., are 1/16 down. These two have given way in consequence of American selling. English Electric 5½ per cent. sinking fund first mortgage debentures are 10 down, at 75. Philips Lamps gave way to 17s. 6d. and Ever-Ready ordinary showed a few pence loss at 19s. Henley's drooped to 5½. Sir George Sutton, who had a very cordial reception at last week's meeting, said that the company's business had expanded steadily for fifty years, and he added the hint that to expect the advance to be uninterrupted would be hardly reasonable. British Insulated are ½ lower at 55s., and Siemens are 6d. down at 23s. 3d. Of the "heavy industries" shares, Babcock improved to 47s. 6d.; Vickers went back to 6s. 9d. There is next to nothing doing in rubber shares.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend 1929.	1930.	Price July 14 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3	—	5 0 0
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb. ...	Stock	—	4½	98¼	+1	4 11 6
Charing Cross Ordinary	1	8½	8½	30/6	+6d.	4 11 10
Chelsea	1	8½	8½	28/-	+6d.	5 0 0
City of London	1	10	10	37/-	—	5 8 1
Clyde Valley	1	8	8	33/9	—	4 14 10
County of London	1	7	10	47/-	+9d.	4 5 1
Edmundsons' 7% Pref.	1	7	7	26/-xd	+1/-	5 7 8
Elec. Supply Corporation	1	11	12½	45/-	—	4 17 9
Kensington Ordinary	1	8	8	29/6xd	—	5 8 6
Lancs. Light and Power	1	7	6½	22/6	+6d.	5 15 7
London & Home Counties 4½% Deb.	Stock	—	—	98xd	—	4 12 0
London Electric	1	8½	9	34/-	—	5 5 11
Metropolitan	1	9	10	2 3/16	+3/32	4 18 9
Midland Counties	1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	1	15	8	28/3	—	5 13 3
Newcastle-on-Tyne Ordinary ...	1	6	6	22/6	—	5 6 8
do. 7% Pref.	1	7	7	27/6	+6d.	5 1 10
Notting Hill 6% Pref.	10	6	6	11¼xd	+¼	5 6 8
North Met. Elec. 6% Pref.... ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	30/-	+9d.	4 13 4
Scottish Power	1	8	8	28/9	—	5 11 5
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	28/3	+9d.	4 19 1
Westminster Ordinary	1	8½	8½	29/6	+6d.	4 16 7
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/6	−8d.	5 17 8
Yorkshire Elec.	1	8	8	31/3	—	5 2 5

Home Rails

Central London Ord. Assented ...	Stock	4	4	76	—	5 5 3
Metropolitan	,,	4	3½	48¼	—	7 4 4
do. District	,,	5	5	64½	—	7 15 0
Underground Electric	£1	8	8	21/-	−6d.	7 12 5

Telegraphs and Telephones

Anglo-Am. Tel. Pref....	Stock	6	6	104½	—	5 14 10
do. Def-	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	12½	12½	32/6	—	7 13 10
Cables & Wireless 5½% Pref. ...	Stock	5½	5½	50½	−5	10 18 0
do. A 7½% Ord.	,,	Nil	—	14	−2	... ...
do. B Ord.	,,	Nil	—	9	−1	... ...
Globe Tel. and T. Ord.	10	10	8½	7½xd	+1/6	*11 6 8
do. do. Pref.	10	6	6	9½xd	—	6 9 9
Great Northern Tel.	10	20	20	27	—	7 8 2
Marconi-Marine	1	15	15	33/3	−7/16	9 0 6
Oriental Telephone Ord.	1	12	12	24½	—	*5 6 6

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	—	12/6	—	... ...
do. do. 2nd Pref. ...	5	6	—	7/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	27½	−8	18 3 8
British Electric Traction Def. Ord.	,,	5	5	975	—	... ...
do. do. Pref. Ord. ...	,,	8	8	124½	—	6 8 9
Brazil Traction	100	8	—	20½	−4½	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	96½xd	+3	5 3 3
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	12/-	—	... ...
London United Tram Deb. ...	Stock	4	4	63½	−2	6 7 0
Mexico Trams, 5% Bonds	—	5	5	42½	—	11 15 4
Mexican Light Common	100	Nil	Nil	46½	—	... ...
do. 7% Pref.	100	7	7	71½	—	9 15 10
do. 1st Bonds	—	5	5	75½	—	6 12 5
Victoria Falls Ord.	1	15	15	58/9	—	5 2 2
Yorkshire (West Riding)		Nil	Nil	6/3	+6d.	... ...

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	20/-	−1/16	6 0 0
do. Pref.	1	8	8	28/-	−6d.	5 14 4
Babcock & Wilcox	1	15	14	47/6	+6d.	*5 18 0
British Aluminium Ord.	1	10	10	29/6	+9d.	6 15 7
British Insulated Ord.	1	15	15	2¾	−⅛	5 9 1
Brush Ord.	Stock	10	5	60	—	8 5 0
Callenders	1	15	15	3¾	—	5 4 4
do. 6½% Pref....	1	6½	6½	26/3	+1/16	4 19 1
Crompton Parkinson Ord.	5/-	30	30	4	—	8 11 5
do. 8% Pref.	1	8	8	28/3	+3d.	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	1	5	Nil	11/3	—	... ...
Enfield Cable Ord.	1	25	25	4	—	6 5 0
English Electric	1	Nil	Nil	5/-	—	... ...
do. do. Pref.	1	Nil	Nil	5/-	—	... ...
Ferranti Pref.	1	7	7	30/6	—	6 16 7
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	14	10	2xd	−3/-	5 0 0
Henley	1	30	30	5½	−½	5 9 1
do. 4½% Pref.	5	4½	4½	4½	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—	... ...
Johnson & Phillips	1	10	10	28/9	—	6 19 2
Siemens Ord.	1	7½	7½	23/3	−6d.	6 9 0
Telegraph Construction	12	10	7½	11½	−1	7 16 9

*Dividends paid free of Income Tax.

Our Foreign Electrical Trade

Imports and Exports during June

THE decline in our external trade continued last month, although, as compared with June last year (in which month Whitsun fell), there were more working days. The Board of Trade returns report a decrease of 31 per cent. in exports and one of about 18 per cent. in imports. Electrical goods and machinery were responsible for a part of these declines, but while exports of this class suffered a fall of 36 per cent., imports decreased by under 7 per cent.

Our table shows that the export total was £71,673 lower than in May, principally on account of falls in shipments of telegraph and telephone apparatus, batteries and accumulators, unenumerated goods, and machinery. The figure thus reached a record low level; the decline has been practically continuous since October last. The decrease of nearly half-a-million sterling as compared with the June, 1930, figure, was spread over all the items with the exception of telegraph and telephone apparatus and carbons, in which there were small increases. Machinery exports fell by £174,812, while exports of insulated wires and cables were less than half of those in the corresponding month of last year. The latter class has diminished very considerably during the past two years.

The inset table gives an analysis by markets of electrical machinery exports during June, comparing the figures with those for June, 1930. The only bright spots in the table are the increases shown in the cases of South Africa and "other countries." Japan's purchases have dwindled to practically nothing, while Australia's appear to be heading in the same direction. European countries, which have recently imported a good deal of British electrical machinery, more than halved their purchases during June which accounted for over half of the decrease. The volume of exports to India remained steady, although the value fell a little. It is of interest to note that in a time of declining prices the value per ton of exported electrical machinery actually rose from £145 to £153 per ton.

Turning to the imports, it will be observed that the May level was maintained; in fact, there was a small increase. Decreases in imports of machinery, telegraph and telephone apparatus, and meters and instruments were more than compensated for by larger imports of unenumerated goods, glow lamps, cables, &c. The decreased total, as compared with June last year, was due mainly to falls in meters and instruments and machinery, but these were largely offset by rises in telegraph and telephone apparatus, unenumerated goods, and other classes.

The re-export section manifested a continuation of the falling tendency of recent months. The only item of interest was a decline of £12,082, as compared with June, 1930, in re-exports of meters and instruments.

We may briefly review the electrical trade during the first half of the year. As we show at the foot of the principal table, export during the period declined by £3,020,222. The value of exported electrical goods and apparatus fell from £6,121,329 in the first half of 1930 to £4,151,003 in the corresponding period of the current year; electrical machinery exports declined from £3,268,831 to £2,218,935. It is worth recording that exports of an allied class, boilers and boiler-house plant actually increased in value. The decrease in the goods and apparatus total was mainly attributable to the fall in the value of cable exports. Insulated wires and cables declined from £1,709,190 to £775,771, non-submarine telegraph and telephone cables from £454,986 to £340,353, and submarine telegraph cables from £193,448 to £82,636. Large falls also occurred in the cases of glow lamps (from £304,610 to £191,070), batteries and accumulators (from £495,664 to £324,601), and switchboards (from £42,132 to £20,508). Only carbons showed an increase—from £5,187 to £8,874. The lower machinery exports were due to a general decline in all markets. Australia took only £87,209 worth, against £437,652 in the first half of 1930; India's purchases fell from £579,184 to £394,102; and those of European countries from £707,957 to £524,052.

The imports of electrical goods and apparatus registered a fall from £3,441,482 to £2,382,621, while machinery imports were lowered in value from £986,699 to £738,470. Practically the whole of the decrease in the former class was due to the greatly reduced imports of meters and instruments, the value of which declined from £1,019,869 to £179,923. Insulated cable imports were valued at £355,172 (against £483,604) and glow lamps at £150,797 (against £216,324). On the other hand, increases occurred in the cases of telegraph and telephone apparatus (from £566,459 to £650,855), arc lamps and parts, and switchboards.

Electrical Machinery Exports

Destination.	Quantities. June, '30. Tons.	Quantities. June, '31. Tons.	Quantities. Inc. or dec. Tons.	Values. June, '30. £	Values. June, '31. £	Values. Inc. or dec. £
Europe ...	1,108	360	− 748	166,048	72,408	−93,640
Japan ...	10	3	− 7	2,790	1,539	− 1,251
South America ...	239	96	− 143	40,708	18,880	−21,828
South Africa ...	201	289	+ 88	27,990	39,152	+11,162
British India ...	389	389	—	63,787	59,639	− 4,148
Australia	208	36	− 172	33,674	4,152	−29,522
New Zealand ...	404	54	− 350	41,016	11,033	−29,983
Canada	282	189	− 93	38,713	16,853	−21,860
Other countries ...	485	593	+ 108	68,858	85,116	+16,258
Totals ...	3,326	2,009	−1,317	£483,584	£308,772	−£174,812

	Exports. Electrical exports for June, 1931.	Exports. Inc. or dec. as compared with May, 1931.	Exports. Inc. or dec. as compared with June, 1930.	Imports. Electrical imports for June, 1931.	Imports. Inc. or dec. as compared with May, 1931.	Imports. Inc. or dec. as compared with June, 1930.	Re-Exports. Electrical re-exports for June, 1931.	Re-Exports. Inc. or dec. as compared with May, 1931.	Re-Exports. Inc. or dec. as compared with June, 1930.
Electrical goods and apparatus (unenumerated)	£146,297	−£11,500	− £63,200	£129,614	+ £16,968	+ £14,579	£6,020	− £196	− £1,120
Insulated cables and wires ...	97,616	− 3,340	− 128,073	64,006	+ 9,793	+ 1,544	1,028	+ 788	+ 372
Glow lamps	33,897	+ 8,293	− 29,702	31,477	+ 10,539	+ 5,165	358	+ 188	− 524
Arc lamps and parts	829	− 486	− 446	5,497	+ 690	+ 3,800	84	+ 30	+ 66
Batteries and accumulators ...	42,153	− 14,264	− 51,188	35,419	+ 336	− 2,999	1,540	− 6,802	− 242
Meters and instruments ...	22,849	− 2,215	− 1,782	22,968	− 9,706	− 78,311	764	+ 36	− 12,082
Carbons	542	− 294	+ 21	12,632	+ 3,981	− 892	206	+ 180	+ 190
Switchboards (not telegraph or telephone)	1,447	− 2,200	− 3,832	165	+ 141	+ 75	—	— 1	—
Electrical Machinery—									
Electrical machinery (unenumerated)	174,326	− 22,264	− 140,684	131,940	− 11,729	− 13,815	10,754	+ 588	− 1 192
Railway and tramway motors	4,192	+ 3,689	− 1,340	—	—	—	—	—	—
Other motors and generators...	130,254	+ 8,362	− 32,788	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	23,200	− 27,662	− 32,191	1,390	− 125	− 1,283	71	+ 46	+ 71
Submarine telegraph and telephone cable	349	− 8,048	− 17,325	—	—	—	—	—	—
Telegraph and telephone apparatus	191,636	+ 257	+ 14,448	96,472	− 8,883	+ 34,126	6,548	− 11,558	− 1,679
Total	£869,587	− £71,673	−£488,082	£531,580	+ £12,005	− £38,011	£27,373	−£16,731	−£16,140
Decrease for first six months of the year		Exports £3,020,222			Imports £1,307,090			Re-Exports £137,779	

Electricity in Canadian Industries

THE July letter of the Royal Bank of Canada shows that all of the power utilised in the production of automobiles, clay products and rubber goods in the Dominion is electrical. Sugar refining, printing and publishing, and plants manufacturing hardware and tools, brass and copper products, coke and gas products, and electrical apparatus and supplies industries are almost entirely electrically operated, while in the long list of industries mentioned in the table of power equipment published by the Dominion Bureau of Statistics, the manufacture of feed and grist is the only one which utilises less than 50 per cent. of electrical energy. Electricity is also extensively used in the mining industry. The total installation in lumber, pulp and paper mills (1,250,000 h.p.) exceeds that in any other industry, while the rate of expansion in non-ferrous metals and in miscellaneous uses has been most rapid.

Statistics have been collected to show the amount of electrical energy generated monthly since 1923. The period from 1923 to November, 1929, was one of rapid expansion in production. The amount of energy generated daily in November, 1929, was 49 million kWh, as compared with 18 million kWh in November, 1923. The significant fact concerning this moving average is that each month through the period showed an increase up to December, 1929. There were years when the increase in this average amounted to between 300,000 and 500,000 kWh per month. In May, 1929, there was a distinct slowing down in the rate of expansion, but the move was still upward until December. For several of the following months the average maintained this high level, but since that time the decline has been quite rapid. A study of statistics shows that in each year there is a tendency for generation of electricity to reach its lowest point in July or August, while the curve has generally reached its highest point in one of the winter months. These sequences have been quite uniform in the past, but the information has not been collected for a sufficient length of time to warrant the assumption that they will not vary in the future; it is not possible to predict the volume of production which will be maintained in July and August, 1931. In April, 1931, the increase in the amount of energy generated as compared with March was substantially more than seasonal. The daily rate for the month amounted to 46,300,000 kWh, as compared with 44,900,000 kWh in March. The most notable gain was in the Province of Quebec, where the increase for the month amounted to 1,200,000 kWh. About 90 per cent. of the increase for the country as a whole took place in Quebec. There were actual losses in Ontario and British Columbia. It is an encouraging fact that there have been only thirteen previous months in which the amount of electrical energy generated in Quebec exceeded the amount attained in April, 1931.

During 1930, new turbine installation amounted to 398,000 h.p. In Quebec, the largest units brought into operation during the year included the 90,000 h.p. development on the Lievre River by the Maclaren-Quebec Power Company, and the 25,000-h.p. unit at Grand Mere by the Shawinigan Water and Power Company. Plant of 58,000 h.p. was installed at Queenston, Ontario, and a 54,000-h.p. plant at Alexander Landing on the Nipigon River was also completed by the Hydro-Electric Power Commission of Ontario. A 13,000-h.p. plant has been installed at the Upper Notch station on the Montreal River by the Canadian Northern Power Corporation to supply additional energy for the Sudbury mining district. In British Columbia a new 18,000-h.p. plant was completed at Jordan River station on Vancouver Island, and a 47,000-h.p. plant installed at Ruskin on the Stave River. The first hydro-electric plant in Saskatchewan was completed by the Churchill River Power Company at Island Falls; this plant will supply the Flin Flon mines and smelter and the mines at Coal Lake. The plant has a capacity of 42,000 h.p., and is designed with a view to a further extension of 42,000 h.p. The Saint John River Power Company installed a 20,000-h.p. plant at Grand Falls, New Brunswick.

In the Monthly Letter of the Royal Bank of Canada for August, 1930, there was a survey of the new and pending projects for power development in Canada. It was shown that installations having a capacity of three million h.p. were either under construction or about to be initiated, but the following important projects were not mentioned. The Bridge River Power Company has completed the initial tunnel for a new 56,000-h.p. plant on the Bridge River, and it is anticipated that the total ultimate development on this site will amount to 600,000 h.p. The West Kootenay Power & Light Co. has commenced operations on the plant on the Pend d'Oreille River which will have a total capacity of 350,000 h.p., and will supply energy to the Consolidated Smelters.

Japanese Electrical Imports and Exports

BELOW are given the values of Japan's imports and exports of electrical and allied goods last year, as stated in the recently-issued returns of that country's foreign trade. The comparative figures for the previous year are also given, together with notes of increases or decreases.

It will be noticed that imports of electrical machinery are still larger than exports, although the former declined severely last year and the latter rose slightly. Imports of all electrical material fell last year. (9.85 yen = £1.)

Imports

	1929. Thous. yen.	1930. Thous. yen.	Inc. or dec. Thous. yen.
Submarine telegraphic and telephonic cables	1,686	260	−1,426
Other insulated wire	257	168	− 89
Wattmeters	908	368	− 540
Ammeters and voltmeters	329	216	− 113
Batteries	422	260	− 162
Telegraph instruments ...	930	530	− 400
Telephonic instruments, total	2,890	1,303	−1,587
Including :— Radio sets...	570	320	− 250
Steam turbines	825	1,025	+ 200
Water turbines and Pelton wheels	1,095	36	−1,059
Dynamos and motors, total	6,830	3,540	−3,290
Including :— Weighing not more than 100 kg.	1,926	1,490	− 436
Between 100 and 500 kg.	1,600	660	− 940
Transformers	650	350	− 300
Dynamos combined with motive machinery	1,325	1,200	− 125

Exports

Insulated electric wire ...	3,530	3,630	+ 100
Electrical machinery and parts	2,450	3,000	+ 550
Telephones and parts ...	920	600	− 320
Electric lamps	5,400	5,320	− 80

Reclamation Schemes in Egypt

(From Our Correspondent in Cairo)

AS agriculture in its various forms is the backbone of the country, the Egyptian Government naturally facilitates irrigation and last year decided to undertake two big projects for the reclamation of several hundred thousands of acres of sandy and marshy lands in the Northern Delta and Upper Egypt (Aswan Province).

Northern Delta Scheme

This scheme is mainly divided into two sections (i) high-voltage overhead transmission lines, and (ii) electric pumping stations. As has already been outlined in our May 8th, 1931, issue, p. 786, the order was secured by Messrs. Siemens Bros., of Woolwich, at a total contract price of £E560,000, or approximately £575,000, which was increased later due to some modifications made in the transmission-line route.

The second part of the order, *viz.*, the electric pumping stations, which are 15 in number, was given to the Metropolitan-Vickers Electrical Co., Ltd. (electric motors, switchgear, transformers, &c.), and to Messrs. Armstrong-Vickers (pumps and their accessories). The total lump sum amounts to £E585,000, approximately £600,000.

The electric power will be produced at one or more of the following generating stations, namely :—(1) Atf : steam turbine station containing three sets manufactured by the English Electric Co., Ltd. The alternators are also to be manufactured by the E.E. Co.; total ouput, 7,500 kW. (2) Belquas : Diesel-engine station containing four air-injection sets manufactured by Messrs. M.A.N. The alternators are to be manufactured by Siemens Schuckert Werke, of Berlin; total output, 3,520 kW. (3) Seru : Diesel-engine station containing four air-injection sets manufactured by the Leobersdorf Werke. The alternators are to be manufactured by Ganz & Co., of Budapest; their total output will be 2,000 kW.

Aswan Scheme

This scheme is also divided into two separate sections : (i) electric pumping stations, and (ii) high-voltage overhead transmission lines. It is intended for the irrigation of an area of isolated basins of 50,000 acres, which cannot take the required amount of water for irrigation from the River Nile during low floods in most years.

The order for these electric pumping stations, being 14 in number, 12 stations for irrigation and two for drainage, was passed to : (1) Messrs. Siemens Orient, agents for Messrs. Siemens Schuckert Werke in conjunction with Messrs. Escher Wyss; and to Messrs. Borsig as sub-contractors for Sections I, III, and IV of the contract, the amount being £E211,000. (2) Messrs. Ganz, of Budapest; Section II only. The amount is £E48,000.

These pumps will be supplied with electricity by means of step-down transformers from a single-circuit overhead transmission line of 33,000 volts, 3-phase, 50 cycles. The overall length of the line will be 130 km, mounted on 600 towers. The order for this contract is under consideration.

The electric power will be generated at the Idfu steam-turbine station by two sets of 2,000 kW each, manufactured by Messrs. Brown, Boveri & Co., of Baden. The contract price for the station amounts to £E200,000.

Legal

Claim for Wrongful Dismissal

IN the King's Bench Division on July 10th, Mr. Justice Rowlatt had before him an action by Mr. R. F. Cerrito, of Hurlingham, against Ripaults, Ltd., of St. Pancras, to recover damages for alleged wrongful dismissal.

Plaintiff's case was that he was an electrical engineer, and was appointed technical manager of the defendant company. He was dismissed in March, 1930. His salary was £600 a year, and he claimed that he was entitled to six months' notice and also to certain commission.

Defendants denied any contract.

Mr. Monkton, K.C., and Mr. O'Malley appeared for the plaintiff, and Mr. Larkie, K.C., and Mr. Cartwright Sharp for the defendants.

His Lordship, after hearing the evidence, awarded the plaintiff £125, and costs.

Marconi's Wireless Telegraph Co., Ltd., v. Lissen, Ltd.

IN the Chancery Division on July 9th, Mr. Justice Farwell had in his list for trial an action by Marconi's Wireless Telegraph Co., Ltd., against Lissen, Ltd., relating to a claim for damages for alleged infringement of plaintiffs' letters patent No. 147,148, for improvements in or relating to electron discharge devices. The patent expired in October, 1929. By their defence the defendants denied that there had been any infringement and alleged that the patent was invalid.

Mr. Whitehead, in announcing that the parties had arrived at a settlement of the action, said that if it had been necessary to go into this matter it would have involved questions of considerable technical difficulty. But a settlement had been arrived at and he was now asking for an order staying all proceedings on terms which it was not necessary to mention, with liberty to apply to enforce the terms if desired. There was no injunction because the patent had expired.

His Lordship ordered accordingly.

"Guaranteed" Electric Lamps.

IN the Shoreditch County Court, on July 10th, Harry Grafstein, trading as "Geeanco," Columbia Road, E., sued C. M. Mackay, Wellesley Road, Walthamstow, E., a traveller and factor in electric lamps, to recover £4 18s. 3d. balance on an account due for electric lamps supplied. The action was originally tried by the Registrar, when the defendant alleged that the plaintiff verbally guaranteed that all his electric lamps were perfect, in exactly the same way as all dealers and manufacturers guaranteed theirs. The plaintiff denied this and judgment was given in his favour. At the new trial, before Judge McCleary, the defendant said that he could not afford to call witnesses as to the guarantee, whereupon his Honour said there would be judgment for the plaintiff for the amount claimed, and costs of the two trials.

C.C.A. Vacuum Cleaners, Ltd. *v* Hoover, Ltd.

IN the Chancery Division on Tuesday last, before Mr. Justice Luxmoore, litigation between C.C.A. Vacuum Cleaners, Ltd., and Hoover, Ltd., was mentioned.

Mr. MORITZ, K.C., for the plaintiffs, said he desired to move to restrain Hoover, Ltd., from using threats under Section 36 of the Patents Act. An allegation was made that the defendants had engaged in a rigorous campaign of threats by newspaper advertisements and personal letters to customers of the plaintiff company, who had been carrying on business and selling their machines in this country for twelve months. The defendants had now issued a writ claiming damages for infringement, but in the meantime the plaintiffs asked for relief.

His LORDSHIP said he could not help the plaintiff company at present having regard to the counter-proceedings by the defendant company. He would stay proceedings in plaintiff's motion pending the hearing of the defendant's action, giving plaintiffs liberty to apply if the defendants did not carry on with their action with due diligence.

Parliamentary Notes

[By Our Special Parliamentary Reporter]

Maximum and Minimum Charges

On July 7th MR. GRAHAM WHITE asked the Minister of Transport if he would state the maximum and minimum prices per unit at which electricity was at present being sold for domestic consumption; and whether he was taking steps to bring about a reduction in such prices where they appeared to be excessive.

MR. PARKINSON, who replied, said that in the case of some of the smallest and most isolated undertakings, the charges for electricity, for lighting purposes only, ranged up to 1s. per unit. He was not in a position to indicate the minimum price charged for an all-in domestic supply, but there were a number of cases where the unit rate of a two-part domestic tariff was as low as ½d. With regard to the last part of the question, the Minister had power to revise authorised maximum prices on application being made to him in the manner prescribed by the Electricity (Supply) Acts.

L.N.E.R. Electrification

On July 8th SIR PHILIP DAWSON asked the Minister of Transport whether, in view of the inadequate services given by the London and North Eastern Railway Company from Liverpool Street station to workers living in West Ham, East Ham, Barking, Walthamstow, Becontree, &c., and having regard to the fact that proposals for electrifying the whole of this area had been worked out, any steps could be taken to induce the railway company to proceed with this work, especially in order to furnish work to those industries which were now suffering most from unemployment.

MR. PARKINSON said his information was that active consideration was being given at the present time by the railway company to alternative schemes for the electrification of the Great Eastern suburban area, but that the company was not in a position to make definite proposals at present. He would, however, call its attention to the question.

SIR PHILIP DAWSON then asked if the Minister could now make a further statement with regard to the proposals of the London and North Eastern Railway Co. to electrify 50 miles of suburban lines out of King's Cross station, and when this work was likely to be taken in hand and the electrification completed.

MR. PARKINSON said that an application by the company for Government financial assistance in connection with the proposals referred to was now under consideration by the Development (Public Utilities) Advisory Committee.

Overhead Lines at Wednesfield

On July 9th MR. MANDER asked the Minister of Transport if he would state the present position with regard to the Wednesfield aerodrome, and when the report of the inquiry held last January might be expected.

MR. PARKINSON said that the application by the Central Electricity Board for the consent of the Minister in respect of certain overhead electric lines near Wednesfield was opposed not only by the Wednesfield Urban District Council but also by certain landowners. The Board was in negotiation with certain of these landowners, and the Minister was awaiting the result of those negotiations before issuing his final decision as regarded that portion of the route.

The London Electric Railway Bill

The Bill promoted jointly by the London Electric Railway Co., the Metropolitan District Railway Co., and the Central London Railway Co. was passed for third reading by the Unopposed Bills Committee of the House of Lords last week. The Bill sanctions an extension between the Elephant and Castle and Denmark Hill, and other extensions and improvements.

The West Ham Bill

This Bill, which, *inter alia*, enables the West Ham Corporation to supply electricity for use outside its area, except for traction, to the L.N.E. Railway Co. received the Royal Assent last week.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Hire-purchase

I should like to confirm the remarks of "Interested" in this week's issue. I have for some time tried to find a finance company willing to take a reasonable view; I failed to see why I should carry all the risk and it take the profit, and at June 30th, 1931, have over £1,000 out on hire-purchase of vacuum cleaners alone, carried by myself. I approached the United Dominions Trust some months ago, but its proposals were not clear, and after several letters I left the matter. Obviously a contractor has only a limited amount of capital, and I have carried out larger jobs through another finance house; but I have to take the risk and pay if there is any default. I had one case—a £100 job—in which I had to pay the remaining balance, and now I get 10s. a week or less from the purchaser, rather than take the apparatus out and claim. The finance company could have done much better.

It is fashionable to blame the contractor, but I can assure Mr. Jarvie that if he will give us a plain statement easy to understand, and reasonable, he will get plenty of business.

I also make use of various manufacturers' schemes, but these are limited.

July 11th, 1931. CONTRACTOR.

Confusion and Doubt

The Editorial Note under the above heading on page 2 of your issue of July 3rd may give the impression that the Institution's Wiring Regulations set up standards not in harmony with those of the B.E.S.A. This is not the case, as the Regulations almost invariably require the B.E.S.A. specifications to be complied with, and it is only in those cases in which there is no appropriate British standard specification that the I.E.E. Regulations lay down the general requirements.

P. F. ROWELL,
Secretary, Institution of Electrical Engineers.

London, W.C.2, *July 10th*, 1931.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1929.

31,903. "Electrical balancing for submarine cables." Siemens-Schuckertwerke Akt.-Ges. December 19th, 1929. (350,868.)

33,228. "Devices for producing the initial formation of the arc in mercury-vapour rectifiers." M. Urbinati. November 5th, 1929. (350,873.)

37,641. "Dynamo-electric machine." W. Fairweather (Singer Manufacturing Co.). April 8th, 1930. (Divided application on 11,101/30.) (350,880.)

37,978. "Mechanism for electrically controlling the position and speed of displacement of objects." Ges. für Electrische Apparate. December 11th, 1928. (350,955.)

38,245. "Multiple switchboard units." H. Dutzmann. December 13th, 1928. (350,990.)

1930.

1,775. "Arrangement for electrical tests on small sections of trunk lines laid for working." Naamlooze Vennootschap tot Keuring van Electrotechnische Materialen. January 18th, 1929. (350,923.)

4,895. "Television and picture telegraphy." Kolster-Brandes, Ltd. (Kolster Radio Corporation). February 13th, 1930. (350,926.)

5,875. "Electric protective systems." R. O. Kapp, C. G. Carrothers and J. Whitcher. February 21st, 1930. (351,033.)

7,411. "Electric furnaces and methods for making glass and the like." J. K. B. Raeder. March 6th, 1930. (350,930.)

7,439. "Panels, slabs, blocks, and the like for constructional, electric insulating and other purposes." Symentis Products, Ltd., and W. A. Jones. March 7th, 1930. (350,931.)

7,724. "Long-distance working in telephone systems." Standard Telephones & Cables, Ltd., and T. S. Skillman. March 10th, 1930. (350,900.)

7,801. "High-speed switching arrangement for picture transmission and television." Telefunken Ges. für Drahtlose Telegraphie. March 8th, 1929. (350,959.)

7,809. "Moving-coil electromechanical devices." A. D. Blumlein and H. E. Holman. March 10th, 1930. (Cognate application 14,042/30.) (350,998.)

8,274. "Magneto-electric machines." Soc. des Moteurs Salmson. April 13th, 1929. (350,961.)

8,398. "Vacuum electric tube devices." F. Barton and Associated Electrical Industries, Ltd. March 15th, 1930. (350,938.)

8,438. "Electron-emitting cathodes." W. W. Triggs (De Vry Corporation Q.R.S.). March 15th, 1930. (351,006.)

8,453. "Telephone systems." Associated Telephone & Telegraph Co. April 5, 1929. (350,912.)

8,534. "Thermionic tubes." Arcturus Radio Tube Co. March 18th, 1929. (350,941.)

8,570. "Piezo-electric crystal system." J. R. Harrison. October 15th, 1929. (350,946.)

8,572. "Electromagnetic vibratory devices." Wireless Music, Ltd., and A. G. Ionides. March 17th, 1930. (350,947.)

8,584. "Temperature-actuated electric devices." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. March 17th, 1930. (350,950.)

8,596. "Train-control systems." Associated Telephone & Telegraph Co., and A. E. Hudd. March 17th, 1930. (351,039.)

8,820. "Telegraph transmission systems." Standard Telephones & Cables, Ltd., E. K. Sandeman and T. S. Skillman. March 19th, 1930. (351,017.)

8,821. "Telegraph systems." Creed & Co., Ltd., R. D. Salmon and F. R. Thomas. March 19th, 1930. (351,018.)

8,941. "Signalling systems for hotels." J. Lyons & Co., Ltd., P. G. Douglass, and C. R. Passmore. March 20th, 1930. (351,048.)

8,988. "Keying arrangements for use in high-frequency circuits." Marconi's Wireless Telegraph Co., Ltd., and F. C. Lunnon. March 20th, 1930. (351,051.)

9,086. "Flasher for high-tension current." J. J. Demoulin. March 21st, 1930. (351,055.)

9,163. "Electric cable clamps." J. G. Miller and Bullers, Ltd. March 21st, 1930. (351,062.)

9,275. "Switching arrangements for two-way telephone transmission systems." Standard Telephones & Cables, Ltd., and K. G. Hodgson. March 22nd, 1930. (351,070.)

9,564. "Telephone systems." Siemens & Halske Akt.-Ges. March 25th, 1929. (351,096.)

10,207. "Electrical power systems." Associated Electrical Industries, Ltd. (Westinghouse Electric & Manufacturing Co.). March 31st, 1930. (351,108.)

10,324. "Locking devices for miners' and other electric lamps carried on the person." Concordia Electric Safety Lamp Co., Ltd., and T. Stretton. April 1st, 1930. (Cognate application 19,011/30.) (351,114.)

10,342. "Continuously evacuated demountable electric discharge tubes." C. R. Burch, J. H. Ludlow, and Associated Electrical Industries, Ltd. April 1st, 1930. (351,115.)

11,139. "Methods for the regeneration of the vacuum in high-vacuum switches." International General Electric Co., Inc. April 8th, 1929. (351,131.)

11,573. "Protective arrangements for systems of electric distribution." British Thomson-Houston Co., Ltd. April 13th, 1929. (351,136.)

11,580. "Synchronised motors." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. April 12th, 1929. (351,137.)

11,840. "Photo-electric cells." L. D. J. A. Dunoyer. April 13th, 1929. (351,142.)

12,943. "Electrodes for electric furnaces." Siemens-Planiawerke Akt.-Ges. für Kohlefabrikate. August 1st, 1929. (351,151.)

13,591. "Metallic vapour rectifiers." International General Electric Co., Inc. May 3rd, 1929. (351,164.)

13,849. "Electric heating devices and the manufacture thereof." Credenda Conduits Co., Ltd., and P. W. Davis. May 6th, 1930. (351,169.)

14,505. "Wireless receiving systems." M. Von Ardenne. May 11th, 1929. (351,184.)

14,941. "Telephone instruments." Siemens Bros. & Co., Ltd., W. E. Goodwin, and E. A. Forceville. May 15th, 1930. (351,190.)

16,485. "Loud speakers and like apparatus." C. S. Agate and F. J. Charman. May 28th, 1930. (351,204.)

16,669. "Radio direction-finders." Telefunken Ges. für Drahtlose Telegraphie. June 8th, 1929. (351,208.)

17,090. "Electric switch-sockets." J. A. Crabtree. June 4th, 1930. (351,213.)

17,644. "Electric switches." British Thomson-Houston Co., Ltd. June 8th, 1929. (351,221.)

18,034. "Electric switches for wireless receiving apparatus." General Electric Co., Ltd., and F. Clark. June 12th, 1930. (351,230.)

18,209. "Electrodynamic sound-reproducing devices." L. W. Murkham and D. T. Bennett. June 13th, 1930. (351,232.)

18,538. "Double-tariff and like apparatus for electric supply." Siemens-Schuckertwerke Akt.-Ges. June 18th, 1929. (Addition to 16,653/30.) (351,235.)

19,216. "Luminous electric discharge tubes." General Electric Co., Ltd. August 29th, 1929. (351,245.)

19,514. "Contacts for electric switches or circuit-breakers." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. June 26th, 1930. (351,253.)

20,290. "Electric accumulators." Chloride Electrical Storage Co., Ltd. (C. D. Galloway). July 4th, 1930. (351,265.)

21,756. "Damp-proof electric switches." Siemens-Schuckertwerke Akt.-Ges. September 9th, 1929. (351,282.)

22,352. "Transmission mechanism for low-power electric motors." Fabrik Electr. Apparate F. Sauter Akt.-Ges. July 30th, 1929. (351,287.)

22,579. "Swivelling couplings for electric conductors." P. E. F. Kruger. July 26th, 1930. (351,288.)

22,679. "Automatic regulating-switch device for controlling multiple-power electrical machines and for analogous purposes." G. Pedrazzo. July 27th, 1929. (Patent of addition not granted.) (351,290.)

22,708. "Electric variator resistances." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 15th, 1929. (351,291.)

22,831. "Methods of insulating electrical apparatus." International General Electric Co., Inc. July 30th, 1929. (351,293.)

23,969. "Telephone call bells, and the mounting of such." P. Doig. August 11th, 1930. (351,302.)

24,820. "Apparatus for indicating deferred signals." Soc. d'Equipement des Voies Ferrées et des Grands Réseaux Electriques. April 25th, 1930. (351,311.)

25,964. "Radio receivers." Kolster-Brandes, Ltd. September 5th, 1929. (351,323.)

26,204. "Cooling of oil tanks for electrical apparatus." Siemens-Schuckertwerke Akt.-Ges. December 20th, 1929. (351,325.)

26,315. "Circuit-breakers." British Thomson-Houston Co., Ltd. September 17th, 1929. (351,329.)

27,074. "Arc-extinguishing means for electric circuit-interrupters." Associated Electrical Industries, Ltd. September 11th, 1929. (351,335.)

27,757. "Sparking-plugs for internal-combustion engines." A. Kegresse. September 19th, 1929. (351,340.)

29,182. "Retardation devices for electric signal-transmission systems." G. Viard. November 13th, 1929. (351,354.)

31,403. "High-tension condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 28th, 1929. (351,366.)

31,558. "Magnetic cores for electrical induction apparatus." British Thomson-Houston Co., Ltd. October 21st, 1929. (351,367.)

35,233. "Television systems." Telefunken Ges. für Drahtlose Telegraphie. December 11th, 1929. (351,378.)

1931.

5,680. "Train-control systems." Associated Telephone and Telegraph Co., and A. E. Hudd. March 17th, 1930. (Divided application on 351,039.) (351,071.)

5,918. "Train-control and/or cab signalling-apparatus." Associated Telephone & Telegraph Co., and A. E. Hudd. March 17th, 1930. (Divided application on 351,039.) (351,072.)

11,834. "Electrical switches or circuit-breakers." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. March 10th, 1930. (Divided application on 7,750/30.) (350,915.)

13,581. "Electromechanical sound-recording devices, more especially of the moving-coil type." A. D. Blumlein and H. E. Holman. March 10th, 1930. (Divided application on 350,998.) (350,954.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 8th:—

R.M.S. (lettering and design). No. 521,527. Class 8. Electrical storage batteries.—T. Standley & Co., 442, Mill Street, Liverpool.

Radiocorder. No. 523,168. Class 8. Sound-recording and reproducing apparatus.—E. K. Cole, Ltd., Southend-on-Sea.

Wybrolaque. No. 516,959. Class 50. Lamp shades and standards.—White Bros., 5, Windus Road, Stoke Newington, N.16.

The N.U.R. Advocates Electrification

At last week's conference of the National Union of Railwaymen, strong support of the proposals of the Weir Committee on Main-line Railway Electrification was expressed by a number of delegates. The general secretary (Mr. C. T. Cramp) said that in technique British electric railways were far superior to those of other countries. In his view the finance for main-line electrification could not be obtained through the usual channels. The necessary money must be provided by the State, which should assume control of the railways.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Cinema (£80,000) for Aberdeen Picture Palaces, Ltd.; A. Marshall Mackenzie, Son & Clement George, architects, 173a, Union Street.

Adlington.—Extension of sewage disposal works for the U.D.C.; T. Leigh, surveyor, Chorley.

Ainwick.—Public library for the U.D.C.; G. Beatty, surveyor, Council Chambers.

Ashford (KENT).—Houses (56), Hampden estate, for the U.D.C.; A. F. Webster, surveyor.

Ashington (NORTHUMBERLAND).—Houses (100) for U.D.C.; G. Beatty, surveyor.

Barnsley.—School (35,157) for the borough E.C.; W. Dunk and Sons, builders.

Barnstaple.—Electric lighting installation, North Devon Infirmary; J. W. Hadfield, electricity works, Castle Street.

Billingham.—Wesleyan chapel, North Terrace (£15,000); trustees.

Blackburn.—Houses (350) for the T.C.; borough surveyor.

Bolton.—Houses (112), Lowndes Street site; housing director, Westminster Bank Chambers, Old Hall Street North.

Bourne (LINCS.).—Shops, surveyor's office, &c., for the U.D.C.; J. S. Fisher, surveyor.

Bristol.—Houses (310), Horfield estate; city engineer. Houses (36), Plummer's Hill (£13,660); E. A. W. Poole & Son. Houses (32), Whitefield Road (£11,520); Gibbs & Davies. Elementary school, Bedminster estate, for the E.C.

Bromley (KENT).—Houses (30), Princes Plain, Bromley Common, for W. & E. Rumph.

Burton-on-Trent.—Factory extensions, British Goodrich Co.; Sir W. Sinclair.

Bury (LANCS.).—Extensions, Aitken Sanatorium (£15,000), for the Joint Hospital Board; Mr. Ward, architect, Birmingham.

Catterick.—Police station, Catterick Camp; county architect, County Hall, Northallerton.

Chesterfield.—Alterations, Lyceum Cinema, Station Road; Whittington Moor Lyceum Picture House, Ltd. Extensions, Victoria Institute, Sheffield Road; trustees. Rebuilding, Hipper Street School (£4,683); G. Beresford.

Colchester.—Aerodrome; borough engineer.

Croydon.—Shops and flats (£13,000) for the T.C.; borough engineer. Houses (176) for the T.C.; E. H. Smith, builder.

Dagenham (ESSEX).—Houses (138), Central Park estate, for the U.D.C., by direct labour; surveyor.

Dartford.—Reconstruction of Orchard Hospital (£377,500); L.C.C. architect.

Derby.—Houses (3,296), various estates, for the T.C.; borough surveyor.

Dorset.—Senior school, Verwood, for the county E.C.; Broad and Dockerill, architects, Lansdowne, Bournemouth.

Douglas (I.o.M.).—Widening, Loch Promenade (£95,000); borough engineer. Alterations, 41-3, Victoria Street; Gellings Foundry, Ltd.

Dudley.—Houses (92) and flats, Wolverton Road; borough engineer. Extensions, Municipal Office; Mr. Harvey, architect. School, Netherton, for the borough E.C.; Webb & Gray, architects, 200, High Street.

Dumfries.—School hostel for the C.C.; J. R. Hill, County Buildings.

Durham.—Schools, Crook (£28,000), East Rainton (£11,000), and West Stanley, for the county E.C.; F. Willey, architect, 34, Old Elvet.

Eastbourne.—Offices for the Pearl Assurance Co., Ltd., Cornfield Road; F. C. Benz, architect, 49, Gildridge Road.

East Sussex.—Girls' secondary school (£31,500) and boys' secondary school, Hove, for the county E.C.; director of education, Lewes. Senior school, Heathfield, for the E.C.; county architect, Lewes. Senior school, Newhaven, for the E.C.; director of education, Lewes.

Eccles.—Fire station, Liverpool Road; borough engineer and surveyor, Town Hall.

Edinburgh.—Extension of biscuit factory for McVitie & Price, Ltd.; A. G. Macdonald, architect, 13, Queen Anne's Gate, Westminster, S.W. Additions to the Cockburn Hotel, 1, Cockburn Street; T. Bowhill Gibson, architect, 30, Rutland Square. Extension of Royal Dick Veterinary College (£30,000); governors.

Ellesmere (SALOP).—Houses (24) for the R.D.C.; surveyor.

Essex.—Schools, Barking, Buckhurst Hill, Great Clacton, Hornchurch (£13,500), and Witham; county architect, Chelmsford.

Farnborough (HANTS.).—Block of shops, Camp Road; A. H. Dungay, architect, Alpha Chambers, Alexandra Road.

Farnham.—Extensions, East Street; Farnham Gas & Electricity Co., Ltd.

Felling-on-Tyne.—Alterations and extensions to Council school (£10,900); surveyor to the U.D.C.

Filey.—Public library for the U.D.C.

Folkestone.—Houses (20), Hill Road, for the T.C.; borough surveyor.

Glasgow.—Houses (115), Langside estate; housing director and trade contractors. Reconstruction of the Plaza Palais-de-Dance; D. J. Cameron, architect, 183, West George Street. Structural improvements to schools (£48,000) for the E.C.

Gosport (HANTS.).—Senior school for the borough E.C.; director of education.

Hertford.—Houses (176) for the T.C.; Dudley Newman, Elliott and Archer, architects, 29, Bedford Row, London, W.C.

Hornchurch (ESSEX).—Houses (24) for the U.D.C.; F. Alderson, surveyor.

Irish Free State.—(MOHILL, Co. LEITRIM).—Alterations to fever hospital for Board of Health; P. H. McCarthy, engineer, 26, Lower Leeson Street, Dublin. (MONAGHAN).—Alterations and additions to the County Hospital; B. Coyle, secretary, Board of Health and Public Assistance, County Home, Castleblayney.

Irvine (AYRSHIRE).—Houses (20), with electrical work, for the T.C.; R. Frew, architect, High Street.

Lanarkshire.—School, Woolfords, and reconstruction of Whifflet School; director of education, Glasgow.

Lancashire.—School, Two Butt Lane, Whiston, for the E.C. (£14,450); E. Taylor & Co., Ltd., builders, Littleborough.

Langport (SOMERSET).—Houses (60) for the R.D.C.; surveyor.

Lincoln.—Houses (80), Skellingthorp; Scott & Turnbull, builders, Leicester.

Liverpool.—Extensions, Rawden Library; Corporation land steward.

London.—(BERMONDSEY).—Flats (50), Page's Walk, and (24) Elgar Street; B.C. works manager. (BETHNAL GREEN).—Improvements, St. Jude's School; managers. (BROCKLEY).—Houses, Bexhill Road, Salehurst Road, and Stillness Road; G. T. Harman. (CAMBERWELL).—Tenements, Glebe estate (£41,930); Gee, Walker & Slater, Ltd., Westminster, S.W. (EALING).—Wesleyan chapel, Greenford (£6,000); trustees. (HACKNEY).—Houses (200); borough engineer. (LAMBETH).—Improvements, infirmary (£26,000); L.C.C. architect. (LEWISHAM).—Houses (128), Grove Park Central estate; W. J. Brise. (ROTHERHITHE).—Rebuilding Percy Hall, Abbey Street; Hall trustees. (ST. PANCRAS).—Buildings, Flaxman Terrace and Mabledon Place; Wallis, Gilbert & Partners, architects. (STREATHAM).—Central school, Furzedown (£21,000); L.C.C. architect.

Ludlow.—Wesleyan chapel, Cleobury Mortimer (£1,500); trustees.

Manchester.—Houses, Wythenshawe (1,100) and Boggart Hole Clough (550); housing director. Cinema, Slade Lane, Longsight (£23,000); H. Davies, architect, 4, St. Mary's Parsonage. Extensions for the National Corrugated Paper Co., Ltd., Ayres Road, Old Trafford; B. Morton & Sons, builders, 78, Quay Street.

Newcastle (STAFFS.).—Two schools (880 places) for the borough E.C.; G. C. Till, director of education.

Newcastle-on-Tyne.—Cinema, Fenham district; Watson and Scott, architects, 16, Pilgrim Street. Down quilt factory, Carville Road, for McClure & Co.; J. F. Simpson, contractor, Northumberland Road. Extensions, Barrasford Sanatorium for the C.C., and Canning Street and Walkergate Council schools, for the E.C.; city architect and surveyor.

Normanton.—Houses (32); W. F. Copp, surveyor, Council offices.

Northampton.—Factory extensions, St. James Street; Warerings, Ltd.

Northwich (CHESHIRE).—Houses (44), Rudheath, for the R.D.C.; J. Birtwistle, surveyor, Whitehall, Hartford.

Norwich.—Extensions, County Offices, Thorpe Road (£17,100); Norfolk county architect.

Oxford.—Extensions, Municipal Offices (£22,000); city surveyor.

Petersfield (HANTS.).—Houses (78) for the R.D.C.; surveyor.

Ramsgate.—Houses (142) for the T.C.; borough engineer.

Rayleigh (ESSEX).—Baptist church; trustees.

Reading.—Rebuilding furnishing stores, King's Road, for John Perring, Ltd.

Reigate.—Houses (26) and flats for the T.C.; G. G. Sanderson, borough surveyor.

Salisbury.—Houses (56) for the T.C.; city engineer.

Scarborough.—Houses (50) for the T.C.; borough surveyor.

Skipton.—Conversion of hospital into Municipal Offices; clerk, U.D.C.

Southport.—Houses (116), Birkdale, for the T.C.; borough surveyor.

South Shields.—Houses (24), Lisle Road, Horton; J. H. Woolgar. Estate development of Cleadon Park for Col. R. Chapman; G. R. Smith, architect. Alterations, 25-31, Denmark Street; W. C. Rippon & Co.

Staffordshire.—Seven schools and extensions (£150,385) for the county E.C.; director of education, Stafford.

Stirling.—Cinema (2,000 seats); Hamilton Neil, architect, 163, St. Vincent Street, Glasgow.

Stockport.—Houses (44), Reddish, for Commercial Estates, Ltd. Shops, Reddish Road, for H. T. Barnes & Son, Woodburne Road, Brooklands, Sale, Cheshire; J. Clark & Son, King Street, Stretford.

Stourbridge.—Re-housing scheme for the T.C.; borough surveyor.

Stretford.—Houses (22), Granby Road; R. P. Wheeler. Houses (30), St. Andrew's Road; E. Jackson & Sons, Ltd.

Taunton.—Public offices (£79,445) for Somerset C.C.; J. Long and Sons, Ltd., builders, Bath.

Torquay.—Clinics, Torbay Hospital, Newton Road; governors. Development of Town Park estate, Shiphay; W. Thompson. Telephone exchange, Churston, for H.M. Office of Works, King Charles Street, London, S.W. Senior school (320 places), Quinta Road, and extensions, Homelands Infants School, for the E.C.

Wakefield.—Science centre, Wakefield College; Massie and Holdsworth. Extensions, Technical College (£7,000); city architect.

Walsall.—Extensions, Whitehall School (£4,400), for the E.C.

Warminster (WILTS.).—Houses (22) for the U.D.C.; surveyor.

Warwickshire.—Senior schools, Southam, for the county E.C.; director of education, Leamington Spa.

Westbury (WILTS.).—Houses (22), Union Lane site, for the U.D.C.; surveyor.

West Riding.—Alterations and additions to Pocklington School; B. B. Stamford, county architect, County Hall, Beverley. School, Rishworth, extensions (£20,000); Rev. C. E. B. Kingsford, head master.

West Stanley (DURHAM).—Houses (300) for the U.D.C.; surveyor.

Wimborne (DORSET).—Houses (32) for the R.D.C.; surveyor.

Windsor.—United Methodist chapel (£24,000), Slough; trustees.

York.—Additions, 20, Blake Street; Britannic Assurance Co., Ltd. Additions, 1, Low Ousegate; Jay's Furnishing Stores. Handicraft and housecraft rooms, St. Denys School; managers.